Rethinking Emergency Habitats for Refugees: Balancing Material Innovation and Culture

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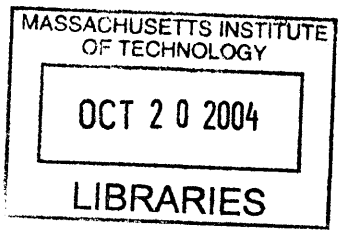

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Abstract

This thesis propose an alternative approach to emergency housing for Colombian refugees, helping development agencies put the displaced community on the road to permanent housing. An environmentally friendly 'smart' material is proposed, based on case studies, material tests, experiments and literature research. This is not just a limited shelter solution, but goes beyond construction to include a balanced combination of building technology, material innovation and culture, that promotes an environment for sustainable development: a habitat.

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Rethinking Emergency Habitats for Refugees: Balancing Material Innovation and Culture

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CHAPTER 1:
INTRODUCTION

1.1 Background

Colombia is a country of approximately forty million inhabitants, about four million of which are internally displaced persons. Four million persons also constitute the number of inhabitants of the third largest city in Colombia – Cali – and the same number is equal to half the population of the Colombian capital, Bogotá. This means that ten per cent of the Colombian population lives in a critical situation not only in terms of housing but in terms of education and health as well, among other factors.

This thesis began with a simple question that arose naturally from these alarming figures: i.e., how to design ideal emergency housing for these persons? The initial idea was to find a practical solution to a practical problem; i. e., doing something that would change the painful situation of these people. Such aspirations were of course uninformed, idealistic and therefore both naïve difficult to achieve.

For this reason, after having investigated deeper into the topic, I went on to try to solve a practical problem, i.e., to design an emergency housing solution, to formulate a research question regarding present housing solutions and what, if any, other solutions should be tried? This question eventually defined the problem to be investigated, motivated by a desire to understand the topic in order to find a way to deal with the problem which, in material terms, has only been partially or defectively understood

I thus moved on from a practical problem regarding the lack of adequate emergency housing solutions to a research question about whether or not the available solutions are worthwhile and what other approximations should be tried. Said research question led me to delve into the present research problem which, as suggested in the title of this thesis, reconsiders the problem of emergency habitats for refugees, seeking a balance between material innovation and culture.

1.2 Methodology

This is the first time that a thesis has been done on the topic of housing for displaced persons in Colombia and alternative materials for providing it. For this reason, the methodology applied in this thesis is different and is quite empirical. Basically what I did was first to try to understand the problem at the local level, and then to understand it at the international level so as to compare it as two facets of the same problem in different scenarios. In doing so, I found evidence on the one hand to support the thesis presented in the first chapter that whatever housing solution is provided for refugees must be made of a flexible material element. On the other hand, I broadened knowledge of the subject of emergency housing. Thus, in chapter three I have managed to consolidate two points: first, the idea that it was a material rather than a constructed housing solution that could solve the housing problem of the displaced, and also to consolidate the way in which said material/skin should be designed.
The other two chapters - 4 and 5 - concentrate more on the topic of skin itself: one on its specialty and the other on its materiality.

CHAPTER 2:
INTRODUCTION TO INNER FORCED DISPLACEMENT.

2.1 Introduction

According to the 2003 report from the Office of the United Nations High Commissioner for Refugees (UNCHR), the approximate number of refugees and displaced persons[2] in the world is of 20.6 million. From that number, 10,000,000 are refugees; 5,800,000 are internally displaced; 2,500,000 are returned refugees; 1,000,000 are asylum seekers; and 950,000 are stateless persons. As the nature of war has changed in the last few decades, with more and more internal conflicts replacing wars among states, internally displaced people have become the second largest group of concern to UNCHR after refugees. According to the same report, Colombia has the largest internally displaced population, followed by Afghanistan, Sri Lanka, The Russian Federation, Bosnia-Herzegovina, Liberia, Serbia-Montenegro, Georgia, and Angola, in that order.

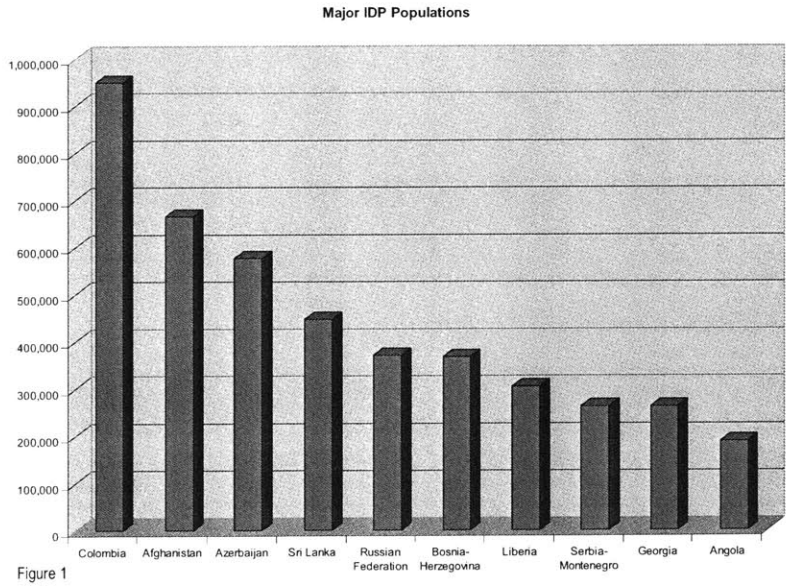

Figure 1

[2] According to the UNHCR a displaced person is someone who has been forced to leave his place of dwelling and has migrated within the same country, whereas the refugee has been forced to migrate to another country

2.2 Diagnosis of Forced Inner Displacement in Colombia

Currently there are approximately two million[3] internally displaced persons in Colombia as a result of the civil conflict in which the country is immersed. Although the problem is not new, it has increased substantially in the last decade. Displacement in Colombia is not only an indirect consequence of the armed conflict, but also a deliberate war strategy. Armed groups, whether paramilitary or guerrillas, commit acts of violence against civilians they identify as sympathizers with the enemy. The severity of these actions generates a feeling of lack of personal safety that leaves the victims with only one alternative to save their lives: migration.

Statistics from the last 2001-2002 *Grupo Tematico Del Desplazamiento* (GTD) report reveals that according to the *Red de Solidaridad Social* (RSS), which is the governmental branch in charge of dealing with this phenomenon, an average of 531 persons are forcedly displaced on a daily basis from their lands. Other source, *Consultoria para los Derechos Humanos* (CODHES) which is a non-governmental organization, affirms that the situation is even worse with an average of 936 persons displaced daily. The total estimates for CODHES are that in the year 2001, 341,925 persons (68,385 families) were forced to leave their lands. On the other hand, according to the RSS, in the year 2001 a total of 190,454 people (42,743 families) were forced to leave their lands. This means that compared with the previous year there has been an increase of 48% in displaced population.

During the last two years, there has been also a significant increase in the territory affected. Besides the areas always named as critical, other states that in the past were not included in the conflict, are now parts of the affected zones. (This is the case of the old "demilitarized area"[4]). According to the governmental agency, RSS, the provinces with the greatest number of people displaced from them are, in descending order: Antioquia, Magadalena, Cauca, Bolivar and Cesar. According to CODHES, the provinces with the greatest number of incoming displaced persons are, in descending order: Antioquia, Cauca, Bolivar, Narino, Cesar, Magadalena and Valle del Cauca. On the other hand, the provinces with the greatest number of people displaced from them are, in descending order: Antioquia, Cauca, Bolivar, Choco and Valle del Cauca.

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[3] Two million displaced persons. However according to other sources the number of IDP's in Colombia could be three million. For further Information please check.

[4] During Andres Pastrana Government as part of the peace talks with the guerrilla forces an area of the size of Switzerland was demilitarized.

The forced inner displacement contributes to the violent decomposition of land tenancy. This process lies behind the armed conflict in which influential economical and political interests are conveniently present. The displaced communities continually arrive in Colombia's main cities (between 30% and 50%), with low return intentions, though facing many hurdles to adapt to the urban environment. This situation not only is expanding the social gap between rich and poor, but also is causing adverse effects on the receiving communities. According to the RSS, the main receptor cities with the largest percentage of inner displaced populations are Bogotá (11.29%), Medellin (3.78%), Valledupar (2.90%) and Cartagena (2.67).

In addition to the displaced communities, the humanitarian crisis also is evident in the so called "comunidades sitiadas" or "communities under siege" by the conflict. Since they do not have the chance to migrate to other places, they are forcedly enlisted in either the guerrilla or the paramilitary forces, and in the worst case their leaders are "disappeared". The situation of ethnic minorities such as the indigenous populations and afro-descendent communities that live in forest isolated areas provides an example.

According to the UNHCR office in Colombia[5], 71% of all refugees are women and children. As a result of their vulnerability, for them forced displacement involves more than exodus. It involves exile and community rupture that leads to a loss of cultural identity.

[5] (UNCHR): United Nations High Commissioner for Refugees. "Survey Among Displaced Women Concerning the Main Aspects of Displacement". Bogotá May 16-18, 2001

2.3 Regional Tendencies of Forced Displacement

There are four regions affected by forced displacement in Colombia: The North West Region, an oil producing area, which includes the Magdalena Medio and south of the province of Bolivar; the North East Region, which includes the north of the province of Choco, the Uraba region and the south of Cordoba Province; the Atlantic coast region, which includes the Sierra Nevada the Santa Marta, located in the north of the Province of Magadalena; and the South Region, which includes the provinces of Valle del Cauca, Narino, Putumayo and Caqueta.

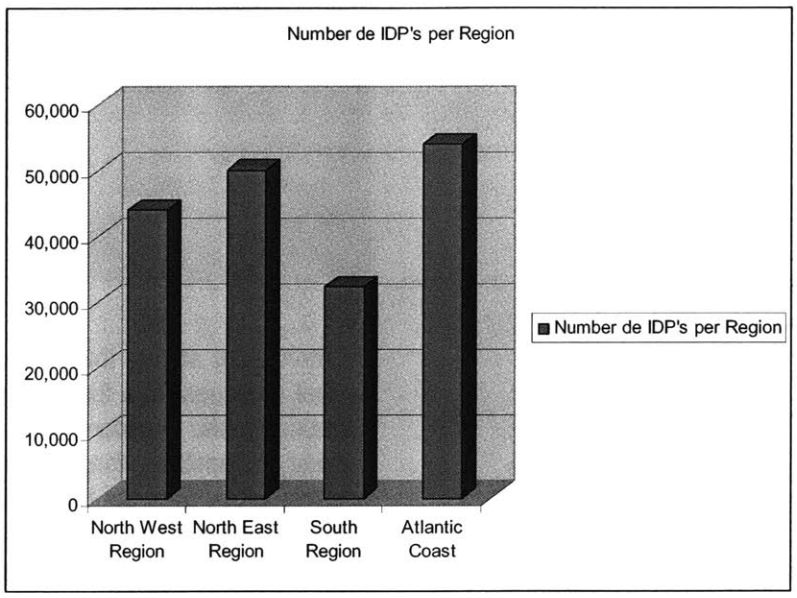

Figure 2 - South Region values correspond to the sum of the IDP's from Putumayo, Narino, Caqueta and Valle del Cauca Regions. Putumayo Total IDP's: 6,709. Narino: 11,606. Caqueta: 5,687. Valle del Cauca: 8,291.

2.3.1. North West Region: Magdalena Medio Region and South of the Province of Bolivar

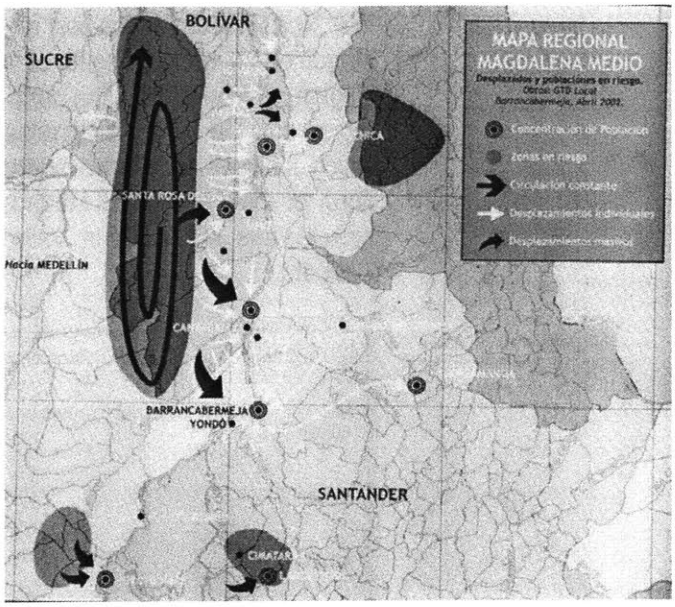

Figure 3

As mentioned above, this region is an oil producing area with high annual revenues from that industry. Because of that, there is a high economical and therefore strategic interest on the area. In the last decade, paramilitary forces dominated the area; however, recently guerrilla forces from the ELN and the FARC have entered the region, thus worsening the conflict. It turned from a military control system to a social control system, reflected in forced displacements and death sentences to local leaders.

The total number of IDP's until December of 2001 probably reached 50.000. According to the RSS' *Unidad Territorial,* in Magadalena the number of displaced populations registered in the year 2001 was of 12.200 persons. The same source reveals that women constitute more than 50% of the displaced population in that region. Similarly, the situation of younger populations (under 18) in the south of the Province of Bolivar is critical, making up 77% of the total displaced population. In the city of Barrancabermeja, some 5000 children under the age of five are affected by forced displacement.

The type of displacement is mainly individual, rural and therefore invisible. This type of displacement is dramatic, since it includes single mothers.

2.3.2. North East Region: Province of Choco, Uraba Region and South of Cordoba.

2.3.2.1. The Province of Choco and Uraba Region

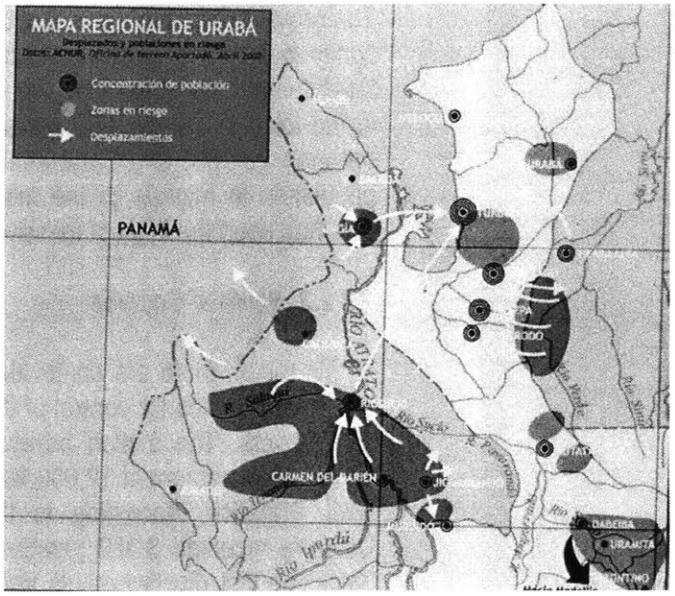

Figure 4

The Province of Choco and the Uraba region are mainly populated by Afro-descendants and indigenous populations. The conflict still is taking place in the rural areas; however everyday it moves closer to small towns. According to statistics from the RSS and UNCHR there is an estimated 44,000 IDP's solely in the Uraba region. *The RSS Territorial Unit* calculates that there are a total of 36,646 displaced persons in the area. This population is located mainly in the banana production area, a rural zone, but still there is an important population in the town of Riosucio in the province of Choco.

In the year 2001, 11 massive displacements occurred in the Uraba region. From these, 7 occurred in river bed areas. In the second part of the year 2001, the most significant displacements occurred in the zones of *Jiguamiando* and *Salaqui.* Besides of massive displacements, there have been occurring since the year 2001 until today individual displacements from Uraba rural area to the towns of Riosucio, Turbo and the city of Cartagena. There is an estimate that in the second period of the year 2001, at least 500 people were displaced from the basin of the Salaqui River.

Individual Displacements still continue to be the most significant rising tide. During the year 2001, according to Apartado city's authority, a total of 1.184 persons (236 families) declared to be forcedly displaced. This population comes from 121 different places of the Uraba Region, and "Tierra Alta' Cordoba. This means that everyday a new family is arriving to the town of Apartado.

The province of Choco is one of the most affected by the conflict; with continuous forced displacements from small towns along the Atrato River to medium sizes cities like Quibdo or Medellin. In the year 2002 in the town of Bojaya, 200 civilians died as a result of an encounter between guerrilla and Paramilitares. This situation forced the town's population to migrate to the nearest cities, Bellavista, and Quibdo. This has been the biggest massive migration in the zone.

2.3.2.2. South of Cordoba

In this region there are continuous confrontations between guerrillas and paramilitaries for control of the valley between the Sinu and San Jorge rivers. The friction between these two groups triggered the forced displacement of 12,000 families in the year 2001, according to RSS Statistics. According to the same source, the province of Cordoba received 3,380 persons (694 families) on the same year. Since the last displacements from the "Nudo de Paramillo" between the months of March and July of 1998, the population has not ceased to migrate. What is particular about this population is their resistance to abandon the region by migrating to near towns in the same area.

2.3.3. Atlantic Coast Region

The violent encounters, massacres, selective murders, and harassments against the civil population have increased since the year 2001. This region expels 21% of the total of all the displaced community and receives 27% of it.

The Magdalena province is one of the regions with more displaced population. 16,353 people (3,276 families) have reached the province in 2001 according to the RSS. This locates this region in the third place after Antioquia and the city of Bogotá. Between January and July of the year 2001 23,045 displaced persons arrived to the municipalities of the Sierra Nevada of Santa Marta. The municipalities of this region expel 8% of the total displaced population in Colombia and receive 11% of it.

2.3.4. South Region: Valle Del Cauca, Narino, Putumayo and Caqueta

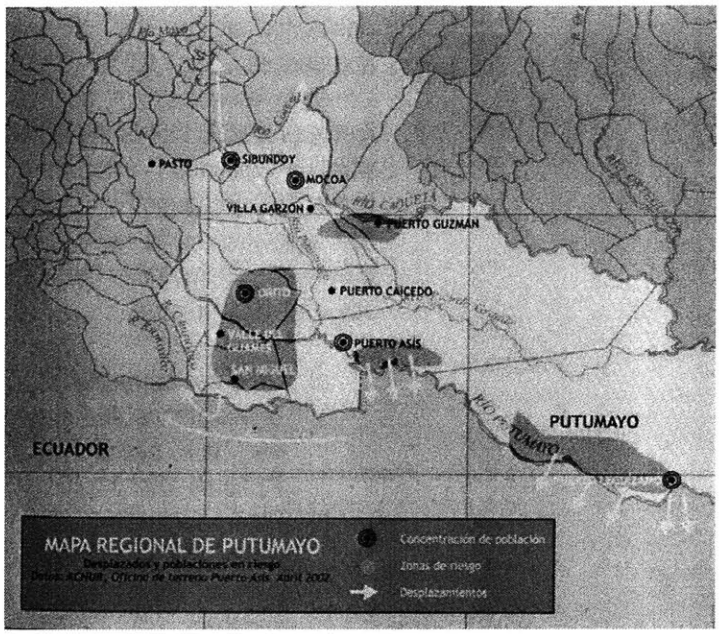

Figure 5

In the Putumayo and Caqueta region, in the year 2001 there has been a progressive increase in forced displacement. A total of 6,706 persons or 1,403 families, are registered by the RSS' Unidad Territorial. The principal cities receiving IDP's are Mocoa, Puerto Asis and Sibundoy. The indigenous population is one of the most affected in this region. This situation triggered a massive migration to Ecuador.

Due to the rise of illicit plantations, there has been an increase in the violence in the province of Narino. In the past it used to be a zone of reception, however, now it is an important region of forced migration. The FARC (Spanish acronym for Colombian Revolutionary Forces) are located on the limits of the provinces of Cauca and Putumayo. In contrast to the situation In the Northwest Region, the guerrilla groups are the dominant forces, and the paramilitary forces are the ones who are looking to gain territory. Actually, the paramilitary forces are the ones who control urban centers such as Pasto, Tumaco, Llorente and Barbacoas and the FARC guerrillas control the rural zone.

The Valle Del Cauca Region is mainly controlled by the Autodefensas (paramilitaries). However in the last years in order to gain control over the region, there has been also an increase on the presence of guerrilla forces, the ELN (Spanish acronym for National Liberation Army) and the FARC.

2.4 Policy for Emergency Humanitarian Assistance (EHA)[1], within the RSS and UNCHR general policy for attention to inner displaced populations. 1999 to 2002

According to the UNCHR there are two different governmental approaches for IDP's in Colombia concerning emergency humanitarian assistance in which emergency housing is included. The first approach is that of the Colombian National Planning Department, which is explained in Document 3057 of 1999. The second approach is the RSS Strategic Plan, which is comprehensive and includes the first approach, and will be analyzed on this subchapter. Both documents characterize the humanitarian assistance according to the stage of displacement.

a) Urgency: corresponds to the crisis phase, where fast actions of assistance and support are needed in order to cover the very basic needs of food, health, and housing during the first 72 hours after the displacement.
b) Emergency: This phase corresponds to the period of time where the temporary settlement is in the process of being defined. During this time the assistance described above is supplied.
c) Transition: This the time after relocation in a temporal shelter. During this period, besides the assistance described below, the displaced community is assisted with psychological rehabilitation.

In addition to the scheme that deals with the time of displacement, there are also other approaches based on the circumstances of the displacement: i.e. how many people are involved - this means if the displacement was individual, by families, massive; the place of arrival after the displacement - this means if it was in rural zones or in intermediate or big cities. Besides this, there is also an established humanitarian attention system coordinated by the RSS. This scheme is based on a network of mobile dwelling camps for semi-rural communities (CAT) (Spanish acronym for Centros de Atencion Transitoria) and Units of Attention and Orientation (UAO) (Spanish acronym for Unidades de Atencion y Orientacion) in the recipient cities.

The RSS Strategic Plan establishes the following goals:

1) Delivery of EHA to at least 194,600 families over a period of 3 years (2000 – 2003).
2) Development of protocols and manuals; determination of minimum performance standards; evaluation of the results of those procedures in the field.
3) Beginning of pilot programs and evaluation of their quality and cost efficiency.
4) Acquisition and installation of 20 emergency mobile camps to accommodate IDP's from collective rural displacements.
5) Establishment of 25 semi-rural CAT's at the principal recipient zones.
6) Establishment of 25 UAO's in the medium and big recipient cities.

2.4.1 Analysis

According to the UNCHR-RSS document, there has been an improvement in AHE compared with previous years; that document claims that the Colombian government has attended 69,054 IDP families out of 159,419 IDP registered homes. This is 43.32% of the total IDP registered population between 1998 and February 2002. However, in contradiction of to government numbers, CODHES statistics reveal that the population covered is less. According to CODHES, the total number of displaced homes is 269,083, as opposed to the 159,419 officially recognized by the RSS. This means that they have covered only 25.66% of the total inner displaced population in the country.

The same variation among official and independent statistics can be seen in the next paragraph of the document. From a total number of IDP's covered (69,054 families), the RSS argued that they have assisted almost 100% of massive forced displacements[6]. On the other hand, they admit that in the case of individual displacements it is not the same. Generally those types of displacements are dealt with by RSS regional offices or by associate NGO's. In this case, the total of individually displaced assisted homes between 1998 and 2002 is of 69,054 out of 159,419 registered. This means that they only covered the third part (33.18%) of the goal of 194,600 homes. According to CODHES, the total of individual forced displacements was 374,483 homes. This means that during the same period of time, the IDP's homes covered were only 15.32% of the total inner displaced population in the country vs. 33.18% officially stated by the RSS.

[6] A massive displacement is when 10 or more families or 50 or more people are involved.

As to the 20 emergency mobile camp kits for the accommodation of IDP's from collective rural displacements, they were never installed. According to the UNCHR-RSS document, two of the main reasons for this could be: i) that the CICR (*Comite Internacional de la Cruz Roja – Red Cross International Committee)* responded to those displacements and ii) that the majority of the massive forced displacements had short duration and were dealt with on the "Cabeceras Municipales".

As to the foregoing point ii) it is important to point out that the quality of the shelters set up at the "Cabeceras Municipales" was extremely poor and also that many of the displacements had long and not short duration. As a matter of fact, the 3 cases that will be explained in the next subchapters demonstrate the contrary. They show that approximately one third of the affected population returned during the first weeks; one third stays between four and six months waiting to have an assurance of their personal safety upon their return; and another third stays for an indefinite period of time.

Passing to the next point, it must be pointed out that the experience of the 25 CAT's that by definition were supposed to be semi-rural centers located at the principal recipient zones, was unfortunate. The idea was to establish a location where the displaced families could have a temporary place to live, work in agricultural activities and have access to local education and health services. However, this was not possible due to the local authorities' lack of commitment, which failed to buy or rent the lands near the urban perimeter of the "Cabeceras Municipales" for the establishment of the camps, even though this was their responsibility.

From the original six points of the RSS strategic plan, only point six, the establishment of 25 UAO in the medium and big receptor cities, was successful.

2.4.1.1 Conclusions

1. Although the Colombian Government established through the RSS a set of six goals to improve the AHE, until now only one point has been successful: numeral six, which deals with documentation and basic orientation, more than with shelter issues. Numerals two and three were only half implemented.

2. Solutions to shelter issues are still in their infancy because there is no real understanding of the phases of urgency, emergency, and transition. Those three phases should be understood as a continuum

process[7] and not as segmented moments in the recovery process. Therefore, the shelter solutions are flawed. The solutions to shelter issued are also in a limbo because responsibilities are not clearly assigned for the implementation of shelter solutions. Neither the government nor the NGO's have defined which are their responsibilities or areas of action. Consequently, all the points concerning "emergency housing policies", the CAT's and the 20 kits of emergency (KOE), are not clear in the document. The explanation is poor. There is no description of materials or processes. The only clear thing is that the CAT's should be located at the "Cabeceras Municipales" and the KOE's near them.

3. From the results showed in the document discussed above and the things observed during the field work at the three refugee camps in Choco, it can be said that the period of three months for AHE supplied by the government and NGO's for the IDP's is insufficient. Taking into account the slow governmental response after this period of time and the IDP's levels of vulnerability, after three months the IDP's are no prepared to go back to their places of origin. According to OIM (*International Organization for Migrations*) studies, the AHE should be extended for up to twenty four months after the displacement in order to receive the appropriate attention during the phases of urgency and emergency transition. This means that in reality the AHE is only covering the phases of urgency and emergency but no the transition, which is an important factor for total recovery. It is important to include with this policy, programs of economic stabilization and psychosocial assistance in order to avoid dependency of the IDP's from the government.

4. In conclusion, since there is no real understanding of the supply of emergency housing, the AHE needs to be rethought and redesigned. The most efficient emergency shelter solutions in Colombia could be the ones that are designed for the real needs on the field from the beginning along with an active involvement from the community during the recovery process. With this, situations like the ones showed on subchapter 2.5.3 where the IDP's stayed indefinitely, not because they wanted to but because they had no other options, would be no repeated. An ideal AHE shelter could be one that includes spatial traditions emerged from the same community with assistance - not interference - from NGO's. The use of local materials, tradition and skills in an informed way, along with technical assistance, could improve the shelter's space quality. The AHE shelter would improve the IDP's future development.

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[7] (next chapter)

2.5 The case of Choco: Quibdo and Bellavista

As the last subchapter concludes, although governmental and non-governmental efforts, what is called "emergency humanitarian assistance" or AHE, is still in the process of development and improvement. The aim of this subchapter is to show the condition of three refugee camps in the province of Choco, with the intention of illustrating the present situation of not only these communities but also the situation of all displaced minorities in Colombia. The beginning of the coming subchapter will give a brief introduction to forced displacement in the Choco region specifically; the second part, will compare and analyze three refugee camps: two in the city of Quibdo and one in the town of Bellavista; and the third part, will give a set of conclusions for the three refugee camps, which at the end will lead to the suggestion of further areas of research on this field.

2.5.1. Introduction: Exodus, displaced population camps and Confinement

According to SISDES[8] and CODHES, the native and Afro-Colombian populations are the most affected by the conflict. In fact, four out of ten displaced persons belong to one of these two groups. 33% of the total of IDP's in Colombia (83,650 persons) belong to the Afro-Colombian community and 5% (12,649 persons) belong to indigenous communities.

According to the same source, the first documented case of massive internal forced displacement in Colombia and in the area of the province of Choco, occurred in 1986 in the Afro-Colombian and indigenous communities of the "Low Atrato" region. Around 20.000 persons were forced to leave their lands because of the confrontations among the paramilitaries, guerrilla, and Colombian army. This was the beginning of current displacements in which the said ethnic minorities are most affected. In fact according to UNCHR they correspond to 23% of the total displaced community, being only 11% of Colombian total population. After this situation, other cases of massive forced displacement occurred but with low intensity, also in the "Low Atrato Region" in the Province of Choco. The most representative forced displacements are: the forced displacement of 4000 persons that were forced to leave the urban center of Jurado Town towards the nearest towns near the limit with Panama; the ones that occurred in the municipalities of Bellavista and Vigia del Fuerte.

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[8] SISDES : Sistema de Información sobre Desplazamiento Forzado y Derechos Humanos In english Informational System of Forced Displacement and Human Rights.

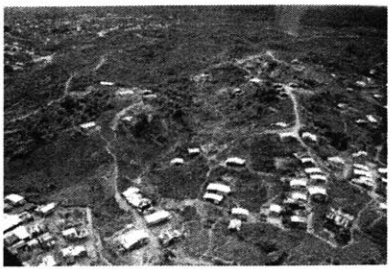

Figure 6 – Aerial View of Quibdo city limits

Figure 7 – Aerial View of the Landscape between Quibdo and Bellavista Town

Figure 8 – Aerial View of Bellavista Town

Figure 9 – Aerial View of Bellavista Town

2.5.2 Analysis of three Refugee Camps in Choco

During the summer of 2003, I had a first hand experience with the African descendent displaced communities of Quibdo and Bellavista. I visited two different refugee camps in the city of Quibdo and one in the town of Bellavista.[9] The purpose of this visit was, besides of getting a closer look at how refugee communities live, to understand their culture and behaviors in order to rethink emergency habitats for similar communities in the future.

In the province of Choco, the African-descendant and indigenous communities have been the most affected by forced displacement, among other reasons because of their strategic location[10], isolation and the little importance given to them by the government. Due to these circumstances, I chose to study the refugee communities of Quibdo and Bellavista in Choco, since they represent both sides of the spectrum: On one hand, communities that left their land individually or in "small groups" to the nearest urban center, which is the case of the three refugee camps in Quibdo. On the other, complete communities that were pushed to leave their town and after some time they return but with the uncertainty of their future after their return. This is the case of the whole town of Bellavista.

Before beginning the comparison of the three IDP camps, it is important to consider the differences between the displaced camps from Quibdo and Bellavista, since the type of forced displacement among them was completely different and therefore the type of "shelters" used was too. In one hand, there is the case of the displaced communities of Quibdo. The biggest refugee camps there were IPC and Villa Espana. The main characteristic of these two camps compared to the one in Bellavista is that their population is not homogenous and also that those communities don't return to their places of origin almost immediately, which is the case of Bellavista. In the case of Quibdo's IDP's, they arrived to the camps at different times. Some of them were displaced individually and some massively, and as a consequence of this the spatial qualities of the shelters are different too[11]. In the case of Bellavista, the whole town was forcedly displaced at the same time to the nearest town across the Atrato River. They returned after a few days to their city of origin, finding a ghost town. From the moment of the displacement until the moment of my visit they had been waiting to be relocated, and this lead to an

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[9] Figures 6 to 9 are images from the trip from Quidbo to Bellavista

[10] Choco state has 2 big rivers: the Atrato and the San Juan that connects the Pacific with the Atlantic Ocean. This Province use to be a commerce route. Now Paramilitaries and Guerrillas fight for the control of this zone in order to transport guns and narcotics

[11] The shelter shows "additions" as a reflection of the different times of IDP's arrival

absence of investment in the town, which resulted in the shelters having poor spatial conditions. Characteristics from IPC were repeated but in a bigger scale.

The following is a comparison between three of the four mentioned camps will be described. Also conclusions of a set of surveys to the Bellavista population are included.

2.5.3. General Comparison of the Three Refugee Camps.

	Bellavista	Villa Espana	IPC
1.Location			
Rural			
Semi-Rural*	X	X	
Urban			X
2.Material Characteristics of the Shelter at the moment of the visit			
was a tent like structure			
was a built structure	X	X	X
3.Type of Shelter			
was a pre-existing shelter	X		X
was a shelter designed and built for the emergency		X	
4.Spatial Qualities			
a. Individual shelters	X	X	
b. Communal Shelters			X
a. On individual Shelters: (aprox)			
1.Area per unit	75 families	60 families	20 families
2.How many units were	5	6	N/A
3.How many inhabitants per house	5	4	N/A
4.How many rooms (without kitchen)	4	N/A	N/A
5.Besides the master bedroom how many room did the house had			
b. On Community Shelters:			
1.How many rooms does it have	N/A	N/A	2
2. How many people per room	N/A	N/A	90/60
3. How many bathrooms does it had	N/A	N/A	3

2.5.3.1 IPC Shelter

GENERAL INFORMATION	
1. Name of the Shelter	IPC – Centro de Integración Popular
2. Year of Establishment	June 2001
3. Name of the Donor	NA*
4. Location	Center of Quibdo
5. Area of origin of the population	Baudo
6. Services	
Water	No
Light	Yes
7. Population total/ Population Profile	20 families/ 150 persons
Male	40%
Female	60%
Kids	50%
PARTICULAR INFORMATION	
1. Type of space	Communal
2. Use of modern Materials and Technologies	Yes
3. Use of Traditional Materials and Technologies	Yes

The IPC shelter is located at Quibdo's center in what used to be a school. At the moment of my visit, this shelter had approximately 150 Inhabitants in a total area of 250 square meters; this means less than the UNCHR minimum standards for emergency shelters. This shelter is a very interesting one, since it represents one of the three types of emergency solutions (tent, use of existing buildings and built transitional solutions).

From the architectural point of view, there are two points to analyze: i) the type and qualities of the space and ii) the materials used. From the type of space, IPC is an L-shaped one-story concrete construction, with two big rooms, a bathroom and a small kitchen. It has only one bathroom and no shower. The roof is made of zinc sheds. The interior floor is covered by tiles and the exterior is made of concrete. Some parts lack any cover, such as the patio which is located at the center of the house. It has four big water tanks used to collect rain water. The collection system is quite primitive but if it is used properly it can be efficient, as Quibdo is one of the regions in the world where it rains the most.

As a result of poverty the whole community shares a single space and a kitchen financed by the UNHCR, with serious health and sanitation problems. The kitchen reflects the mixed technologies (vernacular and modern) in normal housing: use of wood and concrete in its structure and palm and zinc in its roofing material.

Figure 10 – View from IPC Camp. Main façade

Figure 11 – View from IPC's Central Patio

Figure 12– View from IPC's added Kitchen

Figure 13 – View from IPC's main Kitchen's interior.

Figure 14– View from IIPC Main Kitchen Interior

2.5.3.1.1 Materials and technologies used that could be replaced:

There were two approaches at the time of making this evaluation: the first one was to address the problem from the perspective of a permanent settlement, since the house before being an IDP camp was a conventional building. In this case, if any improvement needed to be done, or any material needed to be repaired, it would be more focused in repairing the spaces and improving the overall function of the building. However, this was not the case; the second approach was to address it as a temporary settlement. This is what is proposed since the new use is to house IDP's for a short period of time. In this case the repairs would be focused on the improvement of habitational qualities.

Considering that the goal is to give IDP's a roof, and to cover their minimal necessities in a dignified manner, but without losing sight of the temporality of the camp, hard materials would be replaced by safe, light –easy to install- materials available on location. This was actually done by the IDP's in an improvised manner in the kitchen, where they used zinc, palm and wood. Although this improvised solution is not completely optimal, it has a solid logic behind it because it avoids the use of lasting materials that perpetuate the problem and also respects the spatial evolution process pertaining to these communities.[12] The materials and technologies that could be replaced or improved to reinforce the building's ephemeral character and the IDP's background are hard division surfaces for light materials, such as straw mats and other woven surfaces or skins traditionally made by the IDP's which would be used in the buildings' envelopes and their covers or roofs. The materials of some of these surfaces would be made of Nemka palm, Weguerre Palm or Iraca, among other local plants used in the fabrication of baskets, hats and daily use objects. Other option could be to use Cabecinegro or Damagua, plants that are agglomerated with a technology similar to that used in felt. The most interesting and sustainable approach, however, would be to use a fast growing plant, not a tree, which can supply an envelope/skin for the IDP's camps. This skin solution would be a combined technology of vernacular natural materials and high-tech processes.

These light materials would develop the IDP's self-reliance, simultaneously emphasizing the temporality of the solution. Needless to say, the lightness of the materials would not in any way

[12] This process will be further explained on the next chapter

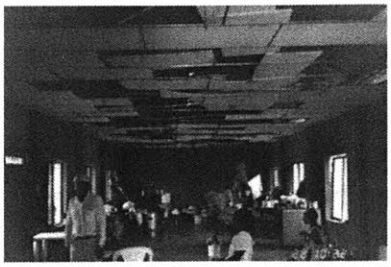

Figure 15– View from IIPC Main Room

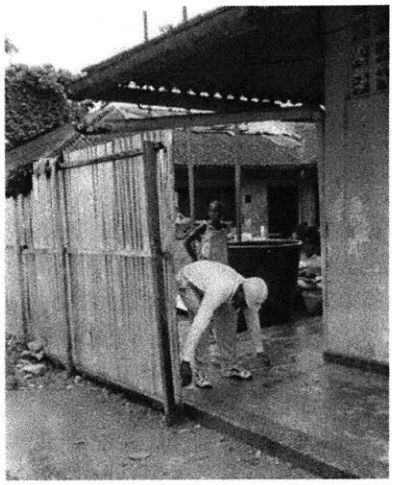

Figure 16– View from IIPC house with the added zinc wall

Figure 17– Aerial from IPC

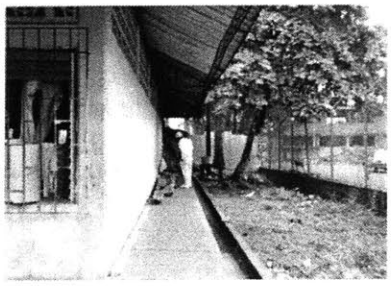

Figure 18– IPC Lateral view

compromise the integrity of the dwelling. It would nonetheless avoid a situation where the emergency housing becomes a slum over time.

2.5.3.2 Explanation of the Comparison Matrix

The following four matrices present the spatial conditions of the IPC shelter from the material point of view at the moment of my visit. The aim of these comparisons was to have an inventory of the existing materials, to evaluate their performances and after that establish what materials or technologies should stay and what other materials or technologies could be replaced in order to improve the quality of the space, and also to introduce innovation.

The first step was to establish the materials traditionally used in the region. I classified those under vernacular materials and they are labeled in green. The second step was to find foreign materials used in the region which are not linked with the afro-descendents and indigenous communities' building traditions. I classified those under imported materials and they are labeled in red.

The next step was to observe which of these materials were applied on the internal and external part of the building. On this categorization I include the materials used before and after the IDP's arrival. After having cleared those facts, I established what materials should be replaced according to their performance. The performance parameters were: thermal insulation, acoustic insulation, adaptability, transportability, cost, sustainability, safety, cultural affinity, and technology. It is important to consider that the comparisons were made from the point of view of the envelope[13], or flexible part of the building, and not the structural point of view or rigid part of the building.

That comparison gave a set of scores that help to identify which materials could be replaced or improved. From that comparison I conclude that the ideal solution for IDP' temporary settlements on that context could be the ones that got the best performance scores, which in other words are the ones more appropriate for the IDPs'

[13] Amina Razvi (March 2002) on her thesis *"A multilateral design methodology for development contexts: a framework for the Dharavi Potters"* talks about Architecture as infrastructure. Although the context of such thesis was more related with design a methodology to supply the community of Dhavari Potters with live workshops, Razvi makes a division that is relevant on the methodology of this thesis. Razvi divides the building into three different parts: flexible which corresponds to the exterior skin of the building, malleable which corresponds to party wall and entrances and rigid which corresponds to the courtyard walls, stairways, floor slabs and frame.

circumstances. On the previous subchapter concrete references and suggestions are given.

INTERIOR INVENTORY

	Raw	Engraved	Sawed	Palm	Palm	Palm
	Wood	Wood	Wood	Mats	Leaves	Strings
Divisions						
Roof						
Ceiling						
Floors						

INTERIOR INVENTORY

	Metallic	Paint	Tile	Wire	Concrete	Styrofoam
	Shields					
Divisions					X	
Roof						
Ceiling						X
Floors			X		X	

EXTERIOR INVENTORY

	Raw	Engraved	Sawed	Palm	Palm	Palm
	Wood	Wood	Wood	Mats	Leaves	Strings
Divisions						
Roof						X
Ceiling						
Floors			X			
Facade						

EXTERIOR INVENTORY

	Metallic Shields	Paint	Tile	Wire	Concrete	Styrofoam
Divisions	X					
Roof						
Ceiling						
Floors			X	X	X	
Facade		X				

	Concrete Divisions	I Styrofoam Roofs	Wood Floors	Palm String Roof	Metallic Divisions
Thermal insulation	3	5		4	0
Acoustic Insulation	5	5		4	0
Adaptability	0	3	3	4	0
Transportability	0	2	2	4	4
Cost	2	2	3	5	3
Sustainability	2	0	3	4	0
Safety	3	0	4	4	0
Cultural Affinity	2	0	4	5	2
A. Technology	2	0	3	3	2
Total	19	17	22	37	11

2.5.3.2 Villa España Shelter

GENERAL INFORMATION	
1. Name of the Shelter	Villa Espana
2. Year of Establishment	Year 2001
3. Name of the Donor	Spain/EU
4. Location	Outskirts of Quibdo
5. Area of origin of the population	Different zones from the Atrato River
6. Services	
Water	No
Light	Yes
7. Population Profile	80 families/ 288 persons
Male	
Female	
Kids	
PARTICULAR INFORMATION	
1. Type of space	Individual
2. Use of modern Materials and Technologies	Yes
3. Use of Traditional Materials and Technologies	Yes

This shelter is located in Quibdo's outskirts. This IDP camp consisted of a set of twelve units aligned in four rows. Every family unit had approximately six to eight members, in a house of an area of 4.5 by 9 meters: 40 square meters the area of a house of four "rooms" of 4 square meters. We are talking about an average room area of 4 square meters per two inhabitants of which is far below to the recommended UNCHR standards of 3.5 square meters per person. Even though the level of overcrowding is not so bad compared with IPC, it is nonetheless critical. In average each dorm space is the size of a conventional double size bed. This means the "room" size it's exactly the same of the bed size. [14] (See figure 24)

Compared with IPC, this type of shelter is completely different in its "architectural typology" and the materials used. It belongs to the "temporary shelter" category that conventionally comes after the tent and before the permanent settlement. This whole "temporary" settlement was designed and built for the emergency phase, trying to mock up in materials and space the characteristics of the permanent homes of the displaced communities. They use traditional wood in the wall system, zinc in the roofing and rammed earth in the flooring. However it was done "so well" that the IDP community stayed with no return intentions.

[14] On this picture the rooms are divided by curtains instead of walls

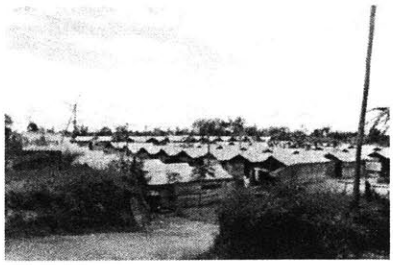

Figure 19 – view from the entire Villa Espana Refugee Camp

Figure 20 – View form one of the "streets" of Villa Espana

Figure 21 – View from the back of the external units of Villa Espana Refugee Camp

Figure 22– View of one of the "model houses" of Villa Espana without extensions

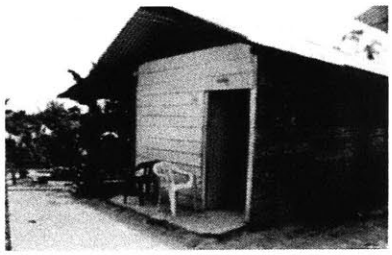

Figure 23– View of one of the "model houses" of Villa Espana with extensions

It is worthy of note the adaptations to the built houses they made. What the second kitchen symbolize in IPC, a "non-organized" space appropriation to the existent building using local traditions and materials, on this case the house's extensions on the lateral sides and the kitchen's roofing system, represents an equivalent situation. On this case, the appropriation is more explicit since occurs in individual shelter units and no in communal spaces like in the IPC. (See figure 26. the roofing system is made of weaved palm)

2.5.3.2.1 Materials and technologies used which could be replaced:

The materials used in the construction of these temporary shelters were traditional wood in the wall system, zinc in the roofing and rammed earth in the flooring. The technologies and materials adapted by the community were concrete and palm. In order to know which of those materials and technologies should be replaced, a comparison matrix similar to the one used on the IPC was implemented. The conclusions here were similar to the findings at the IPC shelter. The most convenient materials to use in order to establish the ephemeral character of those shelters were again local materials used by the IDP's in the past, the same used by the IPC, in the fabrication of their daily use objects and architecture. Since there is not a great variety of constructions materials on the zone, the line between the resources used for architecture and the resources used for objects is almost inexistent.

Again, one of the conclusions is to use a sustainable material capable of replicating the "skin" character of the objects and architecture of the region. Additionally, this "flexibility" will help the IDP's through the recovery process. Since the idea is to respect IDP's cultural heritage also to improve the material quality and performance through innovation, this material should be a smart composite made of local resources. In the future, this material could be complemented with high-tech applications.

Additional Comments:

It would be convenient to change the typology of the housing units, making them more than a conventional house, a group of pieces that can be assembled and dissembled without too much effort. The idea is to make a unit comfortable place to be for a while, but no for a long period.

Figure 24 – View from the inside of one of the Houses
Figure 25 - View from the interior garden of the same house

Figure 26 – View from one of the palm roofs

2.5.3.3 Bellavista

GENERAL INFORMATION	
1. Name of the Shelter	Bellavista Town
2. Year of Establishment	Year 2002
3. Name of the Donor	Colombian Government
4. Location	Bellavista Town/ relocation
5. area of origin of the population	Bellavista
6. Services	
Water	No
Light	Yes/ not all the time
7. Population Profile	389 persons
Male	55%
Female	45%
Kids	60%
PARTICULAR INFORMATION	
1. Type of space	Individual
2. Use of modern Materials and Technologies	Yes
3. Use of Traditional Materials and Technologies	Yes

In May 2002, guerrilla forces engaged in combat with paramilitaries inaccurately fired gas cylinder bombs at the town of Bojaya in the Province of Choco. One of the projectiles struck the town's main church, killing 119 civilians who had gathered inside for protection. For the reason the entire town of Bojaya displaced to Vigia Del Fuerte, the nearest town crossing the Atrato River, and to Quibdo the province capital. After that event, the IDP's that returned to the old town found the place almost all destroyed.

Before starting any reconstruction, the Colombian Government promised relocation. According to them, it wasn't worth reconstructing a whole town in a zone that could be easily flooded, as it was extremely close to the river. Because of this, since May of 2002 there have been no economical investments on the architecture or town planning. This means that the whole town has transformed into a huge refugee camp in a sense.

Among the other the three cases this "refugee camp" is the most different one. In this case rather than being a refugee camp from the "beginning" like the two previous ones, the whole town turned into one. The houses that accommodate 75 families located in the town of Bellavista are maybe the best examples to study indigenous technologies, among the three refugee camps, even though the majority of the houses are not in the best condition. They incorporate afro-Colombian construction technologies without much foreign

intervention. They show different examples of emergency shelter for a displaced community.

The characteristics of the houses (based on RSS statistics) before the tragedy were:

Floor		
Earth	2	2.70%
Cement	11	14.70%
Wood	62	82.70%
Total	75	

Walls		
Wood	70	93.30%
Concrete Block	1	1.30%
Mix	4	5.30%

Roof		
Zinc	71	94.70%
Eternit	2	2.70%
Palm	2	2.70%

Number of floors		
One	64	83.30%
Two	11	14.70%

Number of rooms		
One	0	
Two	3	4.00%
Three	29	38.70%
Four	21	28.00%
More	22	29.30%

More statistics regarding the quality of the bathrooms, use of space, how the water is provided, how they keep it, how they wash their clothes and dishes, how they manage their waste, are not listed but they are taking into consideration at the moment of deciding which materials and technologies should be replaced.

So, based on that information as well as in the study of the different house types of the houses of the Colombian pacific region (Appendix A) the materials and technologies used that could be replaced are the same of the previous two refugee camps.

2.6 Chapter Summary and Conclusions

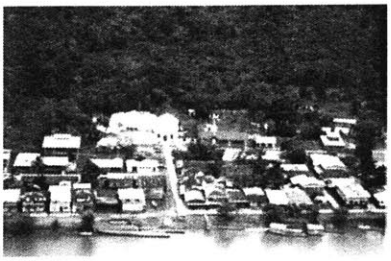

Figure 27– Aerial View of Bellavista Town

Figure 28– View of the new land for relocation

Figure 29– Detail of one of the existent houses in Bellavista

The number of victims of forced displacement is growing by the day. According to the office of the High Commissioner of the United Nations for Refugees, twenty million refugees were registered throughout the world between 2002 and 2003. Of this number, ten million are internally displaced persons; and of this grand total, approximately two million of these victims are in Colombia. (This is without counting another two million registered according to unofficial statistics.)

The victims in question, (the great majority of whom are minority-group members, women, and children), come mainly from four regions: i) the Northeastern Region, which includes the region del Magadalena Medio and the southern part of the province of Bolivar; ii) the Northwestern Region, which includes the province of Choco, Uraba (bordering with Panama and the Pacific Ocean) and the southern portion of Córdoba; iii) the Caribbean Coast Region and iv) the Southern Region which shares its border with Ecuador.

The four regions mentioned above have two things in common: i) they are situated along strategic corridors, i.e., areas close to rivers, borders and jungle zones that are crucial for the localization and strategic mobilization of illegal groups. ii) They are rich in natural resources, a fact which increases the value of these lands and, consequently, the desire to control them. Thus, in the middle of confrontations between the army and illegal armed groups for control of the territory and territorial disputes between guerrillas and paramilitary elements due to the value of the land, innocent civilians are forcibly displaced.

In the midst of the conflict, the internal displaced persons first move within the areas close to their place of origin. Thus, before moving into the large cities, they first locate themselves in towns within their region or in municipal centers and intermediate cities. Due to the fact that the government is not prepared to properly attend this type of emergencies (see point 2.4), the temporary housing solutions are either precarious or nonexistent.

Perhaps the reason for this is because both the Colombian government and the aid agencies have understood the post-disaster recovery process to be a fragmented process instead of an evolving and changing one. Therefore, they divide the period of recovery into three separate phases (urgency, emergency and transition), ignoring the fact that this type of approach leads to additional problems instead of providing solutions. A reflection of this situation are the architectonic solutions they offer which, far from promoting the

development of the internally displaced persons, actually bring them to a standstill in any one of the three phases, since the spatial solutions offered are designed to attend any one of the three phases rigidly.

The three refugee centers visited in Choco demonstrated what has been described above. Visits to those sites made it possible to evaluate whether the existing architectonic solutions, be it the use of already existing buildings as in the case of the IPC or the construction of "temporary" camps as in the case of Villa Espana, were in fact solving anything or whether, on the contrary, they were increasing the circle of existing poverty.

The answer was that the constructions were not solving anything, but rather aggravating the problem to the extent that they were not permitting any transition toward normality.

For this reason, based on a spatial and material evaluation of the three refuges, it seemed that one possible solution would be to approach the problem in a different way. .The approach to emergency housing was re-evaluated through an understanding of the fact that its success or failure is intimately linked to its materiality. This was from a merely practical perspective, where the use of soft materials would obviously be more appropriate to the degree that they would help to establish the temporary nature of the solutions, instead of the use of hard materials that would perpetuate the situation. Nonetheless, the above was done without taking the cultural aspect into account. Persons displaced internally due to cultural and economic elements are intimately related to the materiality.

Thus, for example, in the case of camp IPC the majority of the displaced people who arrived there became stuck in the emergency phase. Instead of arriving at the site, remaining there for only a couple of months and then moving on to a transition or more permanent condition, (either to return home or settle in a city in proper form), they remained there indefinitely. The indolence perpetuated itself. Serious overcrowding and health problems appeared. Thus the site instead of communicating the message of a transitory situation of recovery through the use of space and materials, the materials used communicated the opposite message. Based on observations made in this refuge as well as in the other two, it became clear that in order to solve the problem of emergency housing effectively, it must be approached in a different way, and not by providing tents or constructed solutions, but rather through the provision of material parts.

In conclusion, the emergency housing solutions offered by the government and the aid agencies do not function because the approach is wrong. Instead of providing material solutions (i.e., tents, campsites in already existing buildings, constructed emergency dwellings, which hold the displaced persons back instead of helping them,) they should be given parts, materials so that the community itself can manage its own development. There are two reasons for reaching this conclusion. First, because of the fact that after an emergency the IDP's, due to their mere survival instinct, begin to work on their own recovery, and also because of the fact that they bring with them a knowledge of and a strong tradition in the handling of materials – acquired before displacement – since the latter are deeply rooted in their daily lives. It also seems to be more practical to give them the elements that are to accompany them during their recovery process. Apart from practical reasons, i.e., ideally it would be good to have a flexible element to accompany them during the process since it is cheaper, more practical, etc., and based on the logic of the self-determined progressive growth of the region's poor. In conclusion, the solution for emergency housing is not to be found in static buildings but rather in semi-ephemeral materials that will promote change.

CHAPTER 3: DISPLACEMENT IN THE WORLD, EXAMPLES OF MOBILE AND EMERGENCY HOUSING

3.1 Introduction

Natural and man-made disasters are more than events that cause death, injuries and destruction to property. Disasters are generally a human problem that can be prevented or at least managed if there is a clear understanding of them. According to Phillip O'Keefe, In Ian Davis' book *Shelter after Disaster*, disasters are the interface between natural and man-made hazard in a vulnerable condition. The aim of this chapter is to detect that vulnerable condition, which in this case is the "appropriate" emergency shelter provision, in order to avoid mistaken approaches and additional problems deriving from them. The study of disasters and their impact on housing must be viewed in the context of a society that builds and occupies the housing units.

This chapter will discuss current solutions for emergency housing throughout the world. The first sub-section explains aid agencies' policies, presenting the misconceptions about what the affected communities need in an emergency situation. The second sub-section presents a comparison made by Cambridge University and the Shelter Project organization of different tent types in order to achieve an "ideal" tent solution. From there, performance "lessons" to be kept in mind at the time of designing or making any proposal are obtained. The third sub-section shows different contemporary spatial solutions, not all necessarily related with emergency solutions, in order to understand alternative approaches to dwelling space.

3.2 Shelter and Disaster Management Policies of Multilateral Agencies.

Too often emergency housing is considered by the agencies' simply as an artifact rather than as an end product of a very complicated process. By doing so, they create innumerable problems not only for themselves but also for the communities which they try to assist. Therefore, any serious study of emergency housing or shelter provision must begin at least with an analysis of what normal housing was like before the emergency, since it reflects local cultural patterns derived from vernacular traditions. "*It shows clearly the relations between life styles, values and physical form, the relation of social structure to dwellings, dwellings to the larger environment and so on. The traditional housing and settlement forms, and their associated social and cultural patterns, should be seen as the point of departure rather than being ignored.*" [15]

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[15] Amos Rappaport, *The ecology of housing*. Ecologist, Jan 1973 p. 10

Repeatedly, agencies' approach to either emergency housing for displaced populations or natural disaster victims is based on bias. Perhaps, according to Davis, one of the main reasons for that circumstance is "*poor media coverage that has perpetuated a whole series of myths that are necessary to review and set them alongside the real situation.*" If they hold incorrect views of these situations, it follows naturally that their attitudes will be affected by them. This in turn may be the explanation for decisions made by the donor countries, which appears to be based on myths rather than reality.

According to Ian Davis there are five types of "myths". Said myths refer to vulnerability, social attitudes, shelter needs, reconstruction and provision of aid. However, since the aim of this chapter is to understand the agencies' approach to shelter issues, only the last three topics (shelter needs, reconstruction, and provision of aid) are going to be addressed and discussed, because they help to contextualize the next subchapter, which deals with different examples of emergency solutions supplied by the agencies.

Note: This list of myths is based mostly on the reactions to natural disasters. However, said reactions can apply to man-made disasters as well.

3.2.1 Shelter needs

Shelter Needs **MYTH**	**REALITY**
Assumed Situation	**Actual Situation**
1. There is a need for officials to provide large volumes of emergency accommodation for homeless families.	The reverse is true. Most families appear to go to official shelters only when all other alternatives have failed.
2. There are no clear patterns of behavior relative to shelter provision.	People have clear preferences, which normally follow this order: 1) The homes of relatives and friends 2) Improvised Shelters 3) Covered Buildings 4) Official Provision
3. Compulsory evacuation is an effective policy.	The reverse is true. All evidence from World War II onwards indicates the failures of such policies.
4. Tents are a very effective form of provision.	They can be useful, but evidence suggests under-use and that they often arrive too late to serve their function of emergency shelter.
5. In areas of high exposure risk, shelter needs become matters of life and death.	Obviously this is a critical need, but there is no evidence of deaths or illness directly related to exposure to risks. The social mechanisms which exist in all societies to cope with everyday hazards still function after disasters.

Shelter Needs (Continued) MYTH	REALITY
Assumed Situation	**Actual Situation**
6.Following a disaster people will be prepared to live in unfamiliar forms of housing.	Societies are adaptable, but a form of cultural rejection has occurred in many instances when unfamiliar shelters have been provided.
7. During the emergency period, people will be prepared to live in communal shelters.	The reverse is true. People tend to clutch to the family unit and when facilities have been provided they have not been popular.

Points 3 and 5 are not going to be explained in detail, since they apply to natural disasters only. IDP's are man-made disasters.

First Myth: There is a need for officials to provide large volumes of emergency accommodation for homeless families.

This is not necessarily so. As the chart says, the majority of the families recur to official shelters only when all other alternatives have been unsuccessful. Davies refutes this myth with evidence found in various documents by different authors and also with his own experience, either as an observer or as a consultant. Among said documents are:

A) Robert Carmack's report for aid "*Anthropological Analysis of the Earthquake in Western Guatemala*" US Embassy, Guatemala City, 1976.
B) John Cavanagh. "*Shelter after Natural Disasters*", B:A. in Architecture Thesis, School of Architecture, University of New Castle-upon-Tyne, 1976.
C) John Cavanagh. "*Earthquakes and Pre-Fabs,*" Ecologist, vol 6, no. 3, 1976.
D) Catholic Institute for International Relations and OXFAM Team. Report to the British agencies on Coyotepe refugee camp Masaya, Nicaragua. Report by the team that assisted in the administration of the camp. CIR, July 1973.
E) Charlotte and Paul Thompson, Preliminary Report on Post-Disaster Housing in Chile. OAS (Organization of American States), Bogotá 1976.
F) Ian Cherrit, "*The Guatemalan Earthquake" War on Want, London, 1976*
G) Ian Davis, Managua, December 23, 1972, "*The Provision of Shelter in the aftermath of natural disasters*". Report on Housing Strategy. Research and Development Group, Department of Architecture, Oxford Polytechnic.
H) Ian Davis. "*Skopje (Yugoslavia) rebuilt; reconstruction following the 1963 earthquake*". Architectural Design, Nov. 1975.

Second Myth: There are no clear patterns of behavior relative to shelter provision.

The reality is that people have clear preferences at the time of choosing a place to stay following the disaster.

According to Ian Davies, before asking for official provision, people after a natural disaster go first to the *house of relatives and friends*, then to *improvised shelters*, next to *covered buildings* and finally to *official provision.* Evidence of this behavior is found both in the documents listed on the previous myth that tell of the experiences of the 1972 Managua and the 1963 Skopje earthquakes, and the field experience of the three refugee shelters in the province of Choco, Colombia in which, even though it was a man-made disaster, the preferences proved to be the same.)

In the case of the documents listed above, the case of the Managua disaster of 1972 confirms this specifically after demonstration of local ability to cope and resolve shelter problems; "*on that occasion, a census taken a month following the earthquake indicated that no less than 90% had been absorbed by families and friends. The census figures for just four of the outlying towns indicated that no less than 130,000 had moved in with friends or relations in these towns. Seven weeks after the earthquake a further census revealed that 80,000 were still in their adopted homes. "*

However, it cannot be deduced from these examples that a similar response will take place in other situations or after other types of disasters. For example, the extended family "sponge" cannot work in long-term disasters such as droughts, for the obvious reason that everyone is affected. Another context where it won't function are the refugee camps of Bangladesh, or Bengal, where people have been uprooted from their environment, for in this case the community moves to locations where they don't have any type of family relationship.

What is important to note here is that when it is possible and when the family sponge is still present people (whether IDP's or people affected by a natural disaster) go to relatives, as in the case of the IDP's in the city of Quibdo.

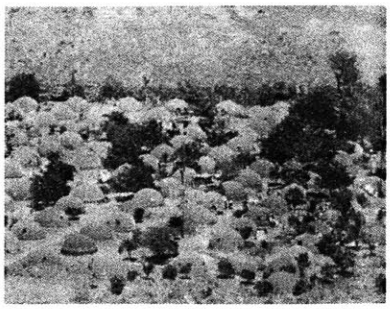

Figure 30– view of West German Red Cross polyurethane igloos

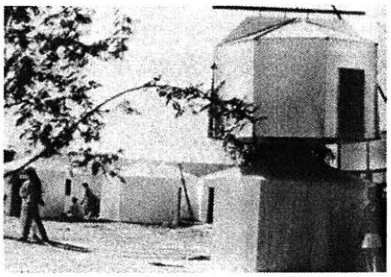

Figure 31 view from OXFAM polyurethane hexagonal igloos

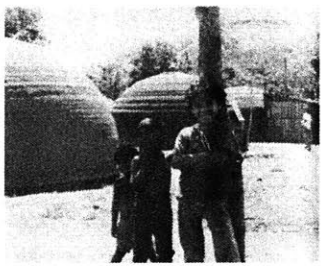

Figure 32– West German Red Cross polyurethane igloos in Masaya Nicaragua

RSS Statistics demonstrate that in fact 32% of the IDP registered population stayed in homes of relatives and friends. 37% in improvised shelters and covered buildings. This is the case of IDP population that stayed in the IPC shelter and the population of Villa Espana prior to their arrival there 31% in official provision.

It is clear that IDP's, like other types of refugees, prefer familiar forms of housing, since these don't disrupt their process of recovery so aggressively.

Fourth Myth: Tents are a very effective form of provision.

As the chart says, they can be useful, but evidence suggests under-use and that they often arrive too late to serve their function of emergency shelter. Evidence of that can be found in:

A) Ian Davis *"Housing and Shelter Provision following the Guatemala Earthquakes of Feb. 4 and 6 1976" Disasters, vol. 1, no. 2, 1977.*
B) Catholic Institute for International Relations and OXFAM Team*; Report to the British Relief Agencies on Coyotepe refugee camp Masaya, Nicaragua. July 1973.*
C) Jon Cavanagh, *"Shelter after Natural Disasters*". Bachelor of Architecture Thesis. School of Architecture, University of New Castle-upon-Tyne, 1976.
D) Ian Cherritt, "*The Guatemalan earthquake". War on Want*, London. April 1976.
F) Fred Cuny. Report on the Coyotepe Refugee Camp in Masaya, Nicaragua. Intertect, Dallas. Feb 1973.
G) Fred Cuny. "*Report on the refugee camp and housing programs in Choloma Honduras for the refugees of the hurricane Fifi".* Intertect, Dallas 1975.
H) Ian Davies, *"Emergency Shelter"*. Disasters 1977
I) Ian Davies, "*Skopje rebuilt; reconstruction following the 1963 earthquake*". Architectural Design, Nov 1975

It is important to note that in the case of the 1976 Guatemala earthquake, fast and positive responses emerged within the community. Examples of those positive responses can be found in various examples. The first example was the massive process of improvised houses that the community built themselves just 24 hours after the disaster. Even though said solutions were not "ideal", they demonstrated a strong bounce-back capacity that could be "redirected" with the right tools. The second example was the creative use of lamina or corrugated iron sheeting. It was distributed and purchased in vast quantities within two weeks after the disaster. It

fulfilled a vital role as temporary shelter, which could then be re-used as roofing for the permanent housing.

Tents were only installed between 2-3 weeks after the disaster. It is important to note that the use of tents can be more useful if they are locally built, or if they used technologies partially obtained from neighboring areas rather than entirely from foreign countries.

Sixth Myth: Following a disaster people will be prepared to live in unfamiliar forms of housing.

Societies are adaptable, but a form of cultural negative response has occurred in many instances when unfamiliar types of shelters have been provided. This is the case of the Managua earthquake of 1972 and the Lice earthquake of 1975.

In the wake of the Managua earthquake of 1972, the government of Nicaragua built 11,635 wooden huts with the help of USAID and the West German Red Cross built approximately 500 polyurethane igloos with the help of the West Bayer Corporation, achieving no great success in either case. In the case of the 500 polyurethane German igloos, they were under-used despite free distribution. In fact, they were not even occupied for the first time until five months after the disaster. Something similar occurred with the USAID wooden huts; they were ineffective as emergency provision because they didn't pay attention to the users' needs and, although they tried to mimic the materiality of the users' previous houses, they didn't succeed. The huts were built on remote sites, insufficient attention was paid to infrastructure, and they were not completed until more than three months after the disaster.

Various types of shelter provision were used in the wake of the Lice earthquake. Among the least successful were the OXFAM polyurethane hexagonal igloos and the standard Turkish post-disaster prefab house[16]. In the case of the 463 OXFAM igloos, built more than a couple of months after the disaster, only three units were still in use twelve months after the disaster. Of course the program was a failure not only terms of cultural acceptance but in cost and time as well. In the case of the Turkish post-disaster pre-fab houses, although they were built quickly, they failed to pay attention to the cultural pattern of the Kurdish people who were to live in them. Therefore, they were unsuccessful, too.

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[16] Timber frame with asbestos cement and corrugated iron roof.

A number of emergency shelters have been professionally designed and commercially produced. They would be seen to be the right answer, meeting the need for prompt provision of high levels of protection in difficult circumstances. However, the production of such units contributes mainly to the economy of the donor society and rarely helps the economy of those who have been stricken by the disaster.

Seventh Myth: During the emergency period people will be prepared to live in communal shelters.

The reverse is true. People tend to clutch to the family unit and when facilities have been provided they have been not popular. Evidence of this can be found in the following:

A) Ian Davies, "*Emergency Shelter*", Disasters volume 1, 1977.
B) Quarantelly and Dynes, "*When disaster strikes: it isn't much like you have heard and read about*". Psychology Today. February 1972.
C) Wenger, Dykes, Sebok and Neff. "*It is a matter of myths; an empirical examination of individual insight into disaster response*" Mass Emergencies, vol.1, 1975.

3.2.2. Reconstruction

Reconstruction **MYTH**	**REALITY**
Assumed Situation	**Actual Situation**
1. Some form of temporary housing is needed prior to reconstruction.	Reconstruction in the third world usually starts immediately and takes place regardless of government plans for relocation, etc...
2. Crash reconstruction programmes by agencies and governments are a highly effective way of solving housing needs.	The reverse is true. An indigenous response will always be the most rapid and effective form of provision, particularly for temporarily unemployed people to build their own homes.
3. The ideal situation (in an area of high risk) is to relocate the community in a safe area.	In few instances where the communities have been relocated have the results been satisfactory, particularly from social and economic standpoints.

First Myth: Some form of temporary housing is needed prior to reconstruction.

Reconstruction in developing countries usually starts immediately and takes place regardless of government plans for relocation. Evidence of this can be found in the following:

A) Catholic Institute for International Relations. "*Honduras: anatomy of a disaster".* CIR, London 1975
B) Jon Cavanagh. *"Earthquakes and pre-fabs".* Ecologist, vol. 6, 1976
C) Ian Davis. "*Emergency Shelter"* Part of Symposium on Emergency Housing and Shelter convened by the Disaster Unit and Disaster Emergency Committee. January 1976.
D) Charlotte and Paul Thompson, Preliminary Report on Post-Disaster Housing in Chile. OAS (Organization of American States), Bogotá 1976.
E) Dennis Wenger and Arnold Parr. "*Community functions under disaster conditions".* Research Report No. 4. Disaster Research Center, Ohio State University, Columbus Ohio, 1969.
F) Wenger, Dykes, Sebok and Neff. "*It is a matter of myths; an empirical examination of individual insight into disaster response"* Mass Emergencies, vol. 1, 1975.

Second Myth: Crash reconstruction programmes by agencies and governments are a highly effective way of solving housing needs.

The reverse is true. An indigenous response will always be the most rapid and effective form of provision, particularly for temporarily unemployed people to build their own homes. Evidence of this can be found in:

A) Atkinson G.A. *"Reconstruction after disaster: the planning problems posed".* Proceedings of the town and country planning summer school, University of Nottingham, 1962.
B) Catholic Institute for International Relations. "*Honduras: anatomy of a disaster".* CIR, London 1975.
C) Jon Cavanagh. "*Earthquakes and pre-fabs"* Ecologist vol 6, 1976.
D) Ian Cherritt. "*The Guatemalan earthquake". War on Want*, London, 1976.
E) Ian Davis, Managua, December 23, 1972, "*The Provision of Shelter in the aftermath of natural disasters".* Report on Housing Strategy. Research and Development Group, Department of Architecture, Oxford Polytechnic
F) Ian Davies. "*Disaster housing: a case study of Managua".*
Architectural Design, Jan. 1975.

G) Ian Davies. *"Guatemala shelter and housing policy in weeks 1-3".* Research and Development Group, Department of Architecture, Oxford Polytechnic, 1976.
H) Ian Davies. *"Emergency shelter",* Disasters, 1977. Bangladesh

Third Myth: The ideal situation (in an area of high risk) is to relocate the community in a safe area.

In few instances where the communities have been relocated have the results been satisfactory, particularly from the social and economic standpoints.

A) Jon Cavanagh. "*Earthquakes and pre-fabs",* Ecologist vol. 6, 1976.
B) Jon Cavanagh, *"Shelter after Natural Disasters*". B.A. in Architecture Thesis. School of Architecture, University of New Castle-upon-Tyne, 1976.
C) Ian Cherrit, "*The Guatemalan earthquake". War on Want*, London. April 1976.
D) Ian Davies, Managua, December 23, 1972. *"The provision of shelter in the aftermath of natural disasters".* Report on Housing Strategy, Dec 1972. Research and Development Group, Department of Architecture, Oxford Polytechnic, Jan. 1974.
E) Ian Davies," *Emergency Shelter*", Disasters.
F) Ivan Osorio. *"Managua rebuilds a city from earthquake ruins".* Geographical Magazine, May 1976.
G) Dennis Wenger and Arnold Parr, "*Community functions under disaster conditions".* Research Report No. 4, Disaster Research Center, Ohio State University, Columbus Ohio, 1969.
H) Wenger, Dykes, Sebok and Neff. *"It's a matter of myths; an empirical examination of individual insight into disaster response."* Mass Emergencies. vol. 1, 1975.

3.2.3 Provision of Aid

Provision of Aid MYTH	REALITY
Assumed Situation	**Actual Situation**
1. Aid is given in response to the needs of disaster victims.	This may be the case, or aid may be given in response to perceived needs of the victims. It may even be given to satisfy the needs of a relief agency or donor government.
2. A rapid recovery is dependent upon a rapid influx of aid.	Often precisely the opposite is the case: a large influx of aid may inhibit the recovery mechanisms, the worst example being the development of "dependency relationships" where local initiative is swamped.
3. The major proportion of post-disaster housing is likely to come from donor sources.	There is no evidence of this. Donor provision from outside the country is normally unlikely to amount to more than 20% of the total.

First Myth: Aid is given in response to the needs of disaster victims.

This may be the case, or it may be given in response to perceived needs of the victims. It may even be given to satisfy the needs of a relief agency or donor government.

Second Myth: A rapid recovery is dependent upon a rapid influx of aid.

Often precisely the opposite is the case: A large influx of aid may inhibit the recovery mechanisms, the worst example being the development of "dependency relationships" where local initiative is swamped.

Third myth: The major proportion of post-disaster housing is likely to come from donor sources.

There is no evidence of this. Donor provision from outside the country is normally unlikely to amount to more than 20% of the total.

3.3. Myths: Conclusions

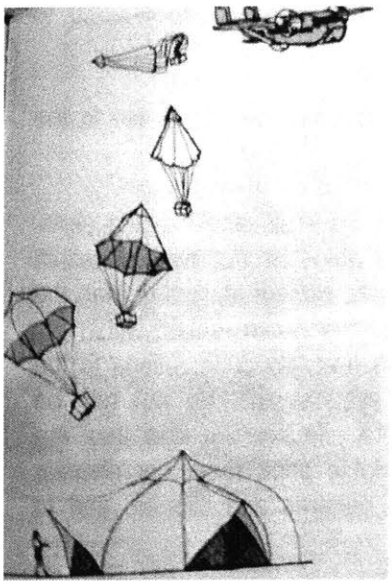

Figure 33– *Moss air-drop shelter*

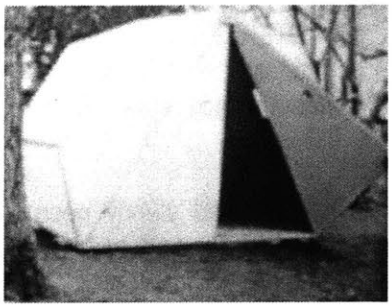

Figure 34– Hope Structures

Figure 35– Completed A frame housing at Demra, Bangladesh

Emergency housing rather than being seen by the agencies as a complex social process intimately linked to the development of those stricken by disaster, is seen as a static artifact that can be put in place anywhere or at anytime, regardless of the context. As Ian Davis says, emergency housing is seen by the agencies in material terms, proper to western rationale, instead of in social terms, in which the house is deeply rooted in the culture of the affected community.

Examples of this unilateral view are the multiple "professionally designed solutions" that naively try to obtain the ultimate universal system of emergency shelter. There is a wide range of examples that vary from experimental designs like the "*Moss air-drop shelter*" which is a parachute house system, or the "*Hope Structures*" which are a type of metallic shelter, to officially-tested ones like the Bayer igloos or the OXFAM hexagons, all of which have failed.

The reason for this failure is that agencies, as mentioned at the beginning of this chapter, in almost all cases are driven by their own understanding, or their own interest in some cases, regarding what the affected community may need. They tend to be blinded by the urgent need to provide assistance, plus the belief that success is to be measured by the number of delivered units rather than in terms of quality,[17] and seem to have a compulsion to deliver items that in some cases are simply not needed.[18]

As reconstruction myth number two reveals, it is important to consider that rebuilding in developing countries usually starts immediately after the natural disaster, regardless of government plans for relocation. Although the scenario here is different, since the affected community consists of displaced populations rather than natural disaster victims, the fact is that the people react promptly to the emergency, building or improving their shelters with the materials at hand. The role of government and aid agencies is to take advantage of the recovery momentum, helping to build emergency shelters with local material and technologies. Tents can accompany the process but should by no means be the only form of provision.

Thus, if the western donor logic, a top-to-bottom approach[19], is replaced by a participatory logic that takes the affected society into

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[17] Its production contributes to the economy of the donor society.

[18] The money that used to be spent on transporting goods around the world can be used instead by experienced officials to buy badly needed materials in nearby towns and neighboring countries.

[19] "This model is a typical industrial or military decision-making model, which is designed to provide control from upper levels of the organization to lower levels, in order to facilitate the

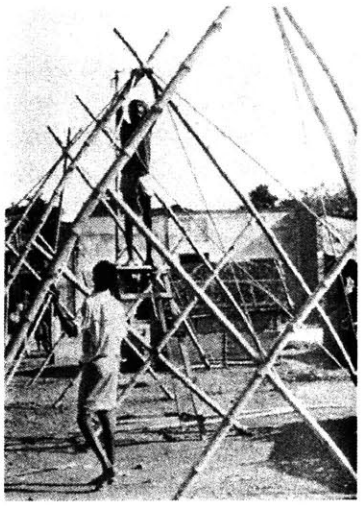

Figure 36– Carnegie-Mellon's frame housing in construction

account, a bottom-to-top approach, typically based on development methodologies and on the facts presented in the above chart of myths and realities, the following points should be considered in order to contextualize the aid, which means:

1. Not excluding the victims from the decision-making phase in the field.

2. Taking account of and using local materials and building skills. Agencies usually either rely upon skills which are not available within the community or introduce new skills without ensuring that the capacity to use them is developed so that it can remain within the community. Normally what happens is that few contributions to the building process are made. Donor systems that do not rely on advanced technology have been more effective because they are more likely to come within an affordable price range for disaster victims, to be better suited to local patterns and climate, and to generate local employment.

One of the most significant developments in low-technology response to disaster has been the work undertaken by Carnegie-Mellon University working with Fred Cuny and INTERTECH in Demra, Bangladesh. This team developed a proposal that relied on indigenous materials and skills to erect "A" frames made of bamboo, a local material, and locally-produced mats.

Although the expertise of advanced technology had clearly been necessary to devise their "A" frame structure to withstand cyclones and force winds, this knowledge was incorporated into the local building technology. "*The ability to teach and transfer the technology in a way that is comprehensible to the users besides keeping the costs of construction and maintenance within their reach*" is a main point for guaranteeing the success of the aid.

Another example of successful incorporation of technology has been the use of lamina sheeting in Guatemala which OXFAM bought in El Salvador. This is a model pattern for donor provision, an excellent gap filler. The purchase of said technology by OXFAM and World Neighbors broke all records and played a vital role in providing temporary shelter, which was later reused as a roofing material for permanent housing.

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delivery of information from top to bottom. By their very nature, they are not conductive to decision making at lower or local levels ; and they prohibit or severely inhibit the upward flow of information. "*Disasters and the Small Dwelling*". *Pg 8.*

These two examples of incorporated technologies or gap fillers demonstrate that a specific product may effectively be *Part* of the process while not constituting the whole solution in itself. They are both good examples of sustainable solutions in terms of materials, time, and the development of improved component systems. They also corroborate the three points put forward by Fred Cuny:

1. *Designers must work with, instead of for, the people.*
2. *Any designer trying to introduce change must begin with what people already have; this means not only the shape, the size etc., of the structure itself, but also the use of indigenous materials, skills and other resources available in the normal housing process.*
3. *The whole idea of developing housing cannot be divorced from the entire development approach. It makes no difference if the house is earthquake resistant if the person hasn't made the choice him or herself to participate and accept what he or she is being presented with. "*

3.4 Comparison among different types of agencies' tents

3.4.1 Introduction

It is well known that there is no "universal standard" for tent and blanket specifications among all relief agencies. That condition was evident in the Oxfam's 2002 field survey of six emergency shelters in the Herat Province of Afghanistan. Said survey showed that IDP's in the same camps were receiving different shelter responses including everything from semi-permanent adobe structures to tents. Within the tent category, there was also a significant variation in design and quality. With this great diversity among different shelter responses there is a danger that the variation in tent specifications will lead to the distribution of markedly different types of tents to people with the same needs, distributing inappropriate tents and thus leading to higher costs and human suffering, as well as unsustainable imported solutions when local solutions are more appropriate.

As a result of that survey, in the year 2002 and subsequent years the University of Cambridge and the "Shelter Project Group" jointly decided to write a report in which tent and blanket specifications for several major aid organizations were described and compared. The intention was to collate design details of shelters, provide technical background for discussion on shelter specifications, share technical information on shelter specifications among agencies, and standardize all the responses to avoid such differences in the future. Three distinct categories were created in order to make the comparisons. The categories compared were: i) family shelters for family groups of up to 8 adults, ii) general-purpose tents for use in hospitals, warehousing, and community shelters, and iii) blankets.

The aim of this subchapter, more than to learn about the planning of an entire refugee camp, which is complex enough to be a separate field of study[20], is to explore the topic of existing family shelters in greater detail. Said category, which is on the immediate scale of the human body, is going to be reviewed here in order to obtain

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[20] When a refugee camp is going to be established, there are three levels of planning. **The** first level corresponds to **strategic planning**, *"which is the national or regional planning response to the transitional settlement and shelter needs of the entire population displaced by the conflict, natural disaster or complex emergency. The second level corresponds to **programme planning** which combines a series of projects into a plan of response for a specific group of displaced people. The third level corresponds to **project planning** which develops the activities to undertake each project within a program."* The three levels of planning within themselves have two points to develop: design a **profile** of the situation and make a **plan** or a report presenting a detailed course of action in response to a profile, listing which organization will undertake which activity over what period. Each section (**profile** and **plan**) has a detailed explanation. To learn more please consult the 2004 transitional settlement for displaced populations by Tom Corsellis and Antonella Vitale.

performance "lessons" to be kept in mind when designing or drafting a proposal.

3.4.2 Description of different types of agencies' tents

Before comparing the different tent categories there are two major points that are important to know:
i) The definition of a shelter, within which the concept of settlement is explained along with the different available settlement options. The different types of tents as well as other shelter options are also reviewed in this section.
ii) The standards used in the report (i.e., the lessons) which are: tent specifications, tent spatial requirements, tent material standards, tent constraints, and tent limitations.

3.4.2.1 Definition of shelter

Tents are just one of the available options at the moment of an emergency among a total of six recognized by the aid sector[21]. Before starting to describe in detail what the different types of tents are like and how many alternative types of tents for emergencies are available on the market, it is important to consider the meaning and importance of the act of sheltering.

According to the 2004 UN/OCHA document entitled "*Tents: a guide to use and logistics of family tents in humanitarian relief*", a shelter is a habitable, covered living space. Its primary priority is *sheltering* people and this means keeping the immediate space around their bodies at a comfortable temperature, both covered and dry, as well as providing them with physical protection, health, privacy, dignity, security and livelihood support. Since "sheltering" is the continuous action of giving shelter, the spatial solution should be flexible and adaptable enough to accompany the IDP during the recovery process and its structure and materiality should reflect that fact.

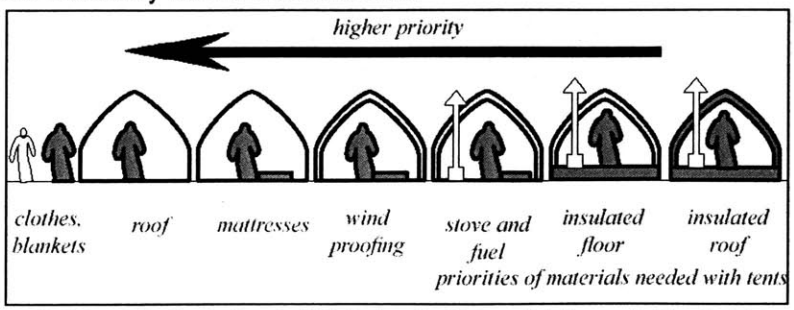

Figure 37. Shelter priorities of non-food items in cold climates. Image from "*Tents: a guide to the use and logistics of family tents in humanitarian relief. UN/OCHA. The Shelter Project Organization*

[21] Those options are explained in point 3.4.2.2

3.4.2.2 Settlement options for sheltering IDP populations.

After clothing, constitute the layer of material that comes closest to the refugee's body. However, in order to improve their performance, tents should be grouped together in a refugee settlement. A settlement by definition is a community of covered living spaces which provides a healthy, secure living environment with privacy and dignity for the people living within its confines.

There are in general three types of transitional settlements:

a) Reconstruction after disaster
b) Reconstruction after conflict
c) Refuge for Displaced Populations

The approach is different for each occasion. The type of transitional settlements for reconstruction after disaster, and for reconstruction after conflict different sharply from settlements for displaced populations. In the first two types of response, i.e., settlements after disaster and settlements after conflict, the non-displaced can quickly repair their houses, or stay with their neighbors, or live in a tent or a temporary structure on their own land or with friends and relatives near their own place or in a planned camp. The point is that they are not uprooted from their traditional habitat, which makes the recovery process easier and faster. In the case of displaced populations, however, they have to move to other locations open to temporary settlement in unfamiliar locations.

When an emergency occurs, there are multiple alternatives for sheltering IDP's: i) Dispersed Settlements, which are the options for individual displacements and ii) Grouped Settlements, which are the options for the displacement of two or more families or massive displacements. This division was the one made by Corsellis and Vitale in their book "*Transitional Settlement for displaced Populations*", in which they expand the response guidelines regarding family shelter requirements for IDP's.

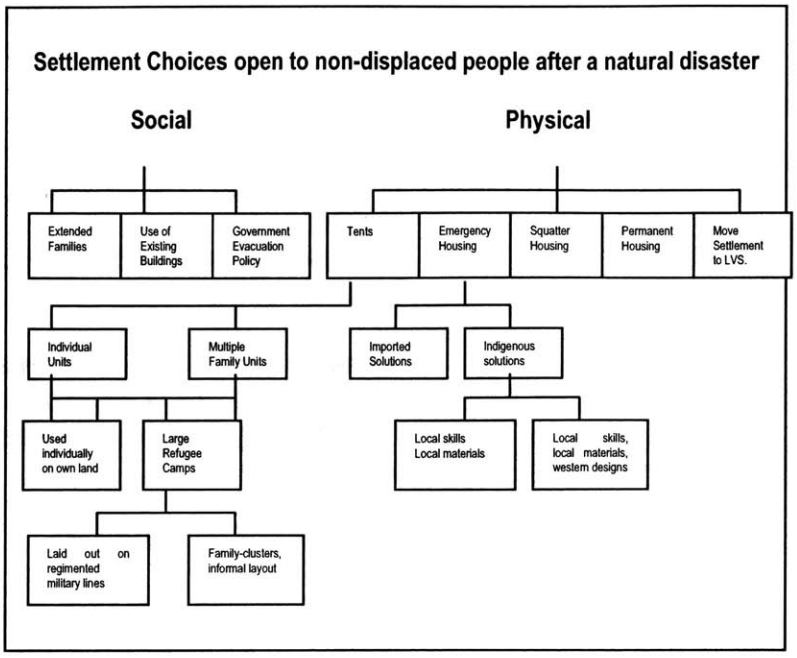

Figure 38 .Ian Davis, Shelter after Disaster, page 42

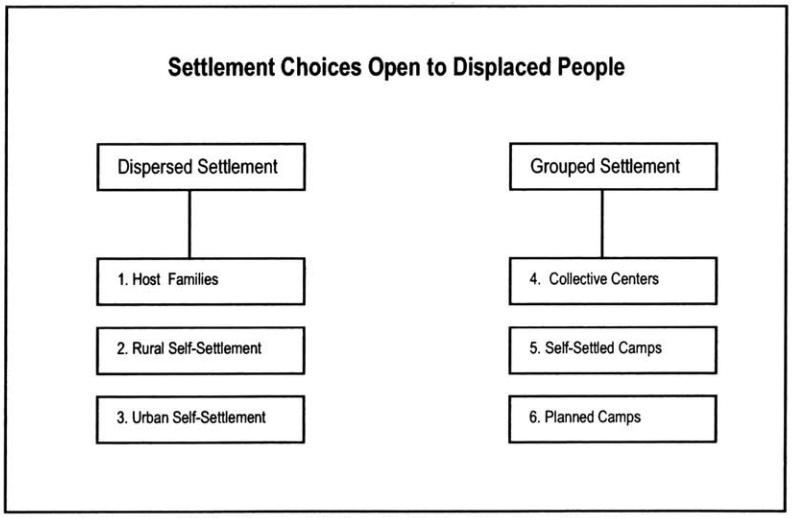

Figure 39. Corsellis and Vitale ,"*Transitional Settlement for Displaced Populations". Page 24.*

3.4.2.2.1 Dispersed Settlements

Within the dispersed settlement category, there are three options:
i) Staying with host families, or on their land or on other properties owned by them.
This option promotes integration with the local population and facilitates a wider social support network.
ii) Settlement on collectively-owned rather than privately-settled land in a rural context.
iii) Settlement in an urban environment, occupying non-reclaimed properties or land.

Those options coincide with what Ian Davies has called social response. This type of responses basically relies on the actions that the community itself can take without including any type of foreign infrastructure.

Advantages & Disadvantages

A dispersed settlement often occurs prior to or regardless of the response by the aid agencies. This is an indication of how important it is for IDP's to maintain their independence and ability to sustain themselves. Therefore, support for dispersed settlement, besides being cost-effective for the aid community since it requires minor initial investments compared with planned camps, can be both practical and efficient because it offers more opportunity for developmental benefits to the local population.

These benefits are:

The possibility of building or repairing common infrastructure and services, where both local and displaced communities gain, thus decreasing the tension between displaced and host populations

Another advantage of this approach is that the aid community can respond quickly to the changing needs and circumstances of displaced groups.

However, it can also cause problems since it may be more difficult for the aid community and host governments to understand the needs of dispersed displaced populations, given the unusual field constraints of both limited personnel and access to population estimates and registration and the problems with respect to population estimates and registration can lead in turn to inappropriately designed assistance programs.

3.4.2.2.2 Grouped Settlements

Within the grouped settlements category, there are three options:
i) Collective centers, or mass shelters, which are usually transit facilities located in pre-existing structures, including schools, warehouses and unfinished buildings.
ii) Those grounded on Self-Settled Camps, where the IDP's settle independently of assistance from either the local government or the aid community. Self-settled camps are often located on state or communal land, usually after having negotiated use and access with the local population.
iii) Those grouped in Planned Camps, where the IDP's find accommodation on purpose-built sites with a complete infrastructure.

These options coincide with what Ian Davies has called physical response. This type of response basically corresponds to any type of infrastructure built for the emergency either by the IDPs themselves or by the aid agencies. Displaced populations often join grouped settlements for security reasons and to increase their visibility to host governments and aid agencies.

Advantages & Disadvantages

This type of settlements are highly convenient compared to the previous type since they offer greater control by community leaders and facilitate the work of aid workers.

Support for this type of settlements can be more responsive to the IDP's changing needs by offering better use of existing coping strategies and local contacts.

Support for this type of settlements can be more effective in offering developmental opportunities for the local population.

However, since support for dispersed settlements is expensive, at the moment of deciding whether or not to support this type of settlements it is important to consider the following points: i) urgency of need often does not allow sufficient time to provide infrastructure for dispersed settlement, although emergency infrastructure can also be provided in dispersed settlements; ii) the sites available for transitional settlements are usually places where there is no local community to integrate into or the local population is not willing to accept the displaced population; iii) the displaced settlement would require different services and infrastructure from the local population; iv) the host community is usually unreceptive to the integration of a displaced

population; v) the only sites available for transitional settlement are in environments where there is normally no local community or settlement within which to integrate displaced people; and vi) the environment is almost always too fragile to support the impact of a refugee camp.

Figure 40 Single Fly Sheet

Figure 41– Double Fly Sheet

Figure 42– Winterized Tent

Emergency Response[22]

Tents offer a possible shelter solution since they can supply cover for both displaced and non-displaced populations.

Before choosing to distribute tents, the following points should be considered:

Can buildings be adapted or repaired rapidly?: In the case of non-displaced persons, consider providing support for reconstruction; in the case of displaced persons, consider the host community.

If not:

Are alternatives to the tent solution possible? Locally constructed shelters may cost about the same as tents, but local alternatives may provide longer-term reconstruction benefits.

If not:

Can people occupy already-existing accommodations?
In some cases, tents may provide additional space.

If not:

Do existing tents need replacement? And if so, can new tents be delivered on time? People may capable of building traditional types of shelters before tents can be distributed.

If not:

Consider distributing tents.

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[22] The following information was taken from Ashmore Joseph. *Tents: A guide to the use and logistics of family tents in humanitarian relief,* UN/OCHA. 2004

3.4.2.3 Tents

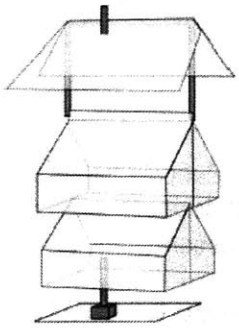

Figure 43– Canvas Ridge Tent

Tents[23] are portable shelters made of fabric. Most commonly, the fabric is cotton canvas or plastic sheeting. A tent is a cover supported by a structure. A tent doesn't provide all shelter needs. People living in tents must have access to suitable non-food items and basic facilities such as water and sanitation. The shelter provided by tents includes the surrounding area, including space for children to play in and drainage ditches.

3.4.2.3.1 Tent Types

There is a variety of three basic tent types, whatever the shape of the tent, which are the following:

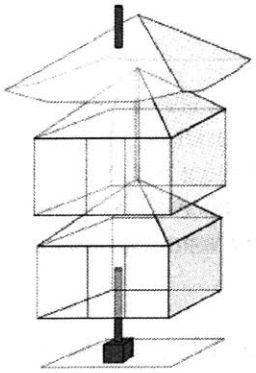

Figure 44– Center Pole Tent – High Walled

i) *Single fly tents,* with one layer of fabric, which are the simplest type of tents and are used in temperate climates; ii) *Double Fly tents,* with one layer of fabric and a fly sheet; which are normally used in warm and humid climates. In hot climates the flysheet type is the most effective way to keep the occupants cool since it is separated from the inner tent, thus creating an air gap; iii) *Winterized tents* that have one layer of fabric and a fly sheet and are used in more extreme conditions when no other options are available. In cold climates, tents should be avoided whenever possible since they are difficult to keep warm because they lose heat quickly.

3.4.2.3.2 Tent Classification

There are six basic types of tents that are used for emergency shelter: i) *canvas ridge tents*, ii) *centre pole tents - high walled*, iii) *centre pole tents - low walled*, iv) *hooped tents*, v) *framed tents,* and vi) *nomadic tents.*

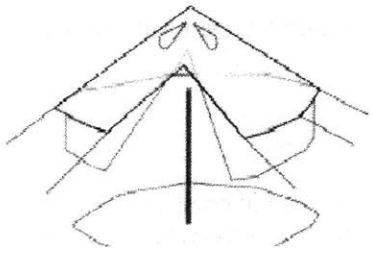

Figure 45– Center Pole Tent – Low walled

<u>i) Canvas ridge tents</u>

This is standard relief tent for many agencies such as UNCHR, OIM UNICEF, and MSF among others. There are versions for both warm and cold climates. What distinguishes them is the number of layers involved. In warm climates, they come with only a single fly, whereas in cold climate they come with an optional inner fly plus a cotton lining and polyester wadding.

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[23] When tents are used they should not be considered in isolation. Tents must be accompanied with suitable food items, and tents must also be accompanied with infrastructure, services, and support.

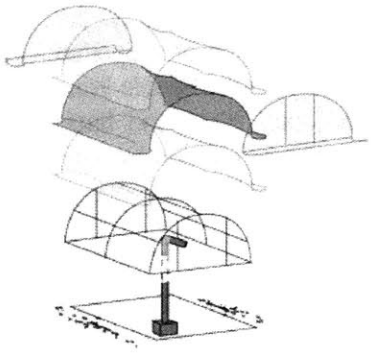


Figure 46– Hooped Tents

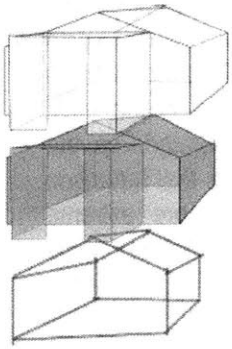


Figure 47– Frame Tents

Cotton or polycotton is normally used for the cover. Galvanized steel poles, painted steel or, in some cases, bamboo is generally used for the frame, the dimensions of which are 4mx4m or 3mx4m.

ii) Center Pole Tents - High Walled.

This type of tent was originally developed by UNCHR for cold climates so as to provide greater living space. The significant design feature of this type of tent is its high walls which give more headroom.

Cotton or polycotton (30% to 50% polyester) canvas is generally used for the cover. Galvanized steel poles, painted steel or, in some cases, bamboo is used for the frame, the dimensions of which are 4mx4m or 6mx4m.

iii) Center Pole Tents - Low Walled

This type of tent is the MSF warm climate tent and is also commonly used by the Iranian and Turkish Red Crescent Societies. Like the Canvas Ridge Tent, this type also comes in different versions for warm and cold climates. What distinguishes them once again is the number of layers involved in their construction: for warm climates a single fly and for cold climates a double fly is used.

The main characteristic of this type of tent is that it has a reduced head height and low doors. In a sense it reminds us of the vernacular expressions of Middle Eastern nomadic settlements and measures from 3 to 4 meters in diameter.

The materials used in both the cover and frame are the same used in the two types of tent mentioned above.

iv) Hooped Tents

This type of tent has the advantage of increased internal space for a given ground plan, no external guy ropes, and the ability to put several units together in a row to extend the structure. Only two versions are known for emergency use: the OXFAM version which has a single fly and is used in warm climates, and the IOM version which has an insulated liner and is designed for use in cold climates.

In contrast with the three types of tents mentioned above, the materials used in this type of tent are plastics or PVC, with high-tech skins, and the tent can measure up to 4m x 4m.

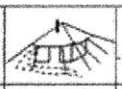
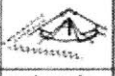
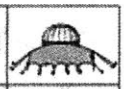
v) Framed Tents

This type of tent is not generally used in the field due to its relative bulk and cost compared with the ridge tent. It requires more poles and material for use than a ridge tent, but it also provides a greater amount of internal space.

As with the previously mentioned types of tent, the framed tent comes in two different versions: one for warm climates that has been tested on a minor scale in the field in Afghanistan and another, for cold climates, which is a fully insulated tent with a porch that acts as a buffer zone between the inside of the tent and the outside climate.

These tents are made of polyester fly and terrylene taffeta liner for synthetic insulation, with a galvanized steel frame, and measure 3mx4m, without including the porch.

The following chart presents a comparison of the six types of available tents most commonly used during emergencies. Details of material standards are presented in Appendix 1.

						
type of tent	**ridge tent**	**centre pole tent - tall wall**	**centre pole tent -low wall**	**hoop tent**	**frame tent**	**nomadic tent (traditional)**
description	traditional relief tent. poles: 2-3 vertical, 1 ridge pole	Centre pole tent with high walls. Walls held up by poles.	Tent with centre pole and low walls.	Tunnel shaped tent.	tent built on a rigid frame from flat poles	tents used by nomadic peoples (many designs exist)
use	family use	family use	family use	family use	family use	family use
advantages	tried and tested design	good headroom.	relatively lightweight	good headroom, small footprint	good headroom throughout.	well adapted to local climates materials and traditions
dis-advantages	limited head-room at sides	Can suffer in strong winds. heavy.	limited headroom	requires many poles. technology in development	requires many poles often expensive.	large scale production in short period not possible
weight with flysheet	75-120kg	120kg	50-100kg	40-80kg	100-120kg	200-300kg

.Figure 48. From "Tents *a guide to the use and logistics of family tents in humanitarian relief. UN/OCHA. The Shelter Project Organization*

3.4.2.5 Alternative to Tents

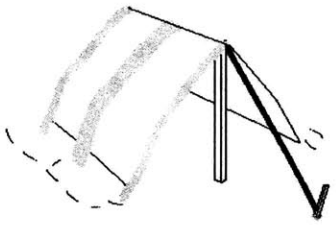


Figure 49– Plastic Sheet, poles and ropes

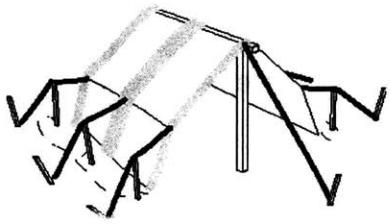


Figure 50– Plastic Sheet, poles and ropes

Figure 51– Traditional Shelter

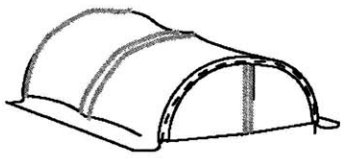


Figure 52– Tunnel Structures

Tents are not the only possible form of emergency shelter structure. Depending local conditions, repairs can be made quickly or temporary shelters can be created from locally available materials such as plastic sheeting, wooden poles, and rope. Support for such shelters can involve communities more actively and the materials thus distributed can have a longer lifetime than that of tents. They may also be made available quicker and at lower cost than tents.

i) Plastic sheeting, poles, and ropes
ii) Traditional shelter
iii) Tunnel structures

i) Plastic sheeting, poles, and ropes

According to *UN/OCHA's "Tents: a guide to the use and logistics of family tents in humanitarian relief"*, distribution of plastic sheeting is one of the most common parts of emergency shelter provision. Providing plastic sheeting for poles can significantly reduce local environmental damage caused by many people cutting down large trees to create frames for emergency shelter. Providing rope, nails and other fastening materials will help people to fix the sheeting for their dwellings more firmly, thus extending its use and durability.

Materials: plastic sheeting, metal sheeting, wooden or metal poles, UV stable rope, nails.

ii) Traditional shelter

According to the same report, locally built shelters are constructed using local technology, materials, and building traditions. They may vary from quickly erected structures of sticks and leaves to more solid shelters using earth or cement. Such shelters may be later upgraded as a step towards reconstruction and permanent housing. Long – lasting, locally built housing may be cheaper than supplying people with tents.

Materials: Traditional shelters generally use locally available materials such as woven sticks, rammed earth, adobe, plastic sheeting, leaves, old metal sheeting or straw.

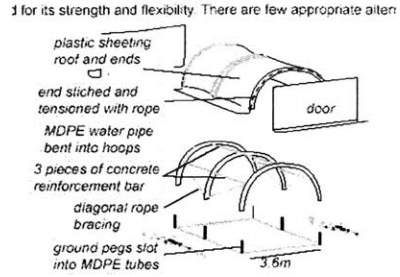


Figure 53– Tunnel Structures

iii) Tunnel structures

A design of a tunnel shape structure that can be made from building materials. If available, agricultural polytunnels can be used as an alternative.

Materials for the 3.6m x 3.6 m tent (using a 7x4m plastic sheet cutting from a roll):

3x 6m MDPE water pipe
3 x 3.6m x 12 mm iron bar for horizontal bars
6 x 3.6m x 12mm iron bar (pegs)
1x 7m x 4m UNCHR/MSF standard plastic sheeting
2x 2m x 2m UNCHR/MSF standard plastic sheeting

3.4.2.5.1 Conclusions of Alternative to Tents

Advantages:

Among the advantages of distributing sheeting, poles and rope to IDP's, is the fact that can they can contribute to a very rapid shelter response. Good quality materials of this type may remain useful for a long time and may later be adapted by people to help them reconstruct their houses.

Among the advantages of locally built shelters is the fact that they often cost less than tents since they require lower transport costs. Other advantages are that they are also culturally appropriate, better for future adaptation, easy to repair and maintain. A final advantage is that they last longer and often provide a more thermally comfortable environment.

Among the advantages of tunnel structures is the fact that they have a short lead time if the relevant materials have already been supplied for water and sanitation programs. They can also be manufactured on site without too much effort.

Disadvantages:

Vulnerable people and their ability to construct shelters must always be taken into account when distributing basic materials to construct their houses. Distributing poles, rope and sheeting may not provide as complete a shelter as a tent does, especially in extreme climates.

The major disadvantage of tunnel structures is that the MDPE pipe is often difficult to obtain in sufficient quantity and quality.

One disadvantage of traditional shelters is that they take longer to build and can be politically unviable because they may encourage people to stay in "temporary" settlements which may turn out to be politically unsustainable. They may also cause environmental damage due to the harvesting of natural building materials such as timber and grass. Furthermore, if they are built too well, tensions may develop between the displaced people and the host community.

3.4.2.6 Alternative Materials

As explained in the previous section, there are alternative shelter structures for tents. These alternatives use materials other than the conventional cotton canvas to form the skin of the tent. Said materials include: i) plastic sheeting, ii) profiled metal sheeting, iii) local materials reeds and grasses and, for the structure, iv) timber, v) bamboo, and vi) poles.

The aim of this sub-section is to present the advantages and disadvantages of these materials in order to open ground for the development of new covering surfaces within the parameters observed.

i) Plastic Sheeting:

Advantages:

This is a cheap material which is readily available and widely used in the field. It is both waterproof and durable although eventually degradable by UV exposure. It is also resistant to insect attack and to temperatures between -20 and 80 degrees Celsius.

Disadvantages

One disadvantage of using plastic sheeting is that temperature differences can cause brittleness at specific points where the sheeting comes into contact with a warm surface.
Tearing is another problem if the sheeting is not fixed to the frame properly or if it comes in contact with sharp edges
UV degradation also causes clear sheeting to become brittle after six months of exposure to sunlight. Darker polythenes are more resistant in this case, but they imply reduced light transmission

ii) Profiled metal sheeting

Advantages:

This material is readily available and widely used in developing countries and has a life span of approximately five years

iii) Local materials, reeds, and grasses.

Advantages:

They are readily available and often widely used..
Thatch a good option for roofing in the second phase of construction.
Thatch provides good insulation.

Disadvantages

It is necessary to harvest large quantities of this material, thereby depleting supplies in the surrounding area.
It is heavier than plastic sheeting, so greater structural support may be needed.
Special skill is needed in construction with these materials, but may be available among local/migrant populations.

iv) Timber

Advantages:

Timber is widely available.
It can be produced locally, thus cutting costs and time.

Disadvantages

Local timbers may not be stress-graded, so it is advisable to overcompensate on structure.

v) Bamboo

Advantages:

Bamboo is cheap and widely available.
It has traditionally been used for construction in tropical and semi-tropical regions where it grows abundantly.

Disadvantages

Traditional skills or expert supervision are needed since bamboo cannot be nailed.

vi) Poles

Advantages:

They are cheap and widely available.
They permit the use of trees that are too thin to be sawn into planks and can therefore be cheaper than sawn timber.

Disadvantages

The dimensions are variable.
Round sections can make fixing difficult.
They tend to split at the ends.

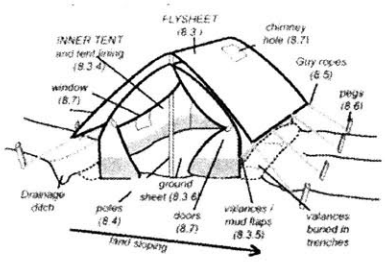


Figure 54– Tent component parts

3.4.2.7. Performance Lessons Regarding Tents

According to the shelter project's last peer review[24], there are three performance categories to keep in mind when designing any type of tent, which are the following: i) logistics specifications, ii) physical specifications, and iii) social specifications. All three are going to be mentioned below. However, for the purpose of this chapter only the last two sections are going to be explained in detail.

3.4.2.7.1 Logistics:

1. Tents should minimize logistics requirements and costs, while maximizing the logistics options for their transport; this means that tents should be as light as possible with a weight of 40 kg for a conventional tent and 60 kg for a winterized tent.

2. A packed tent should occupy the minimum volume possible, i.e., from 0.3 to 0.5 cubic meters for a non-winterized tent with a liner.

3. Tents should be easy to transport; which means that tents should be packed in a sensible size that allows them to fit in a standard pallet; i.e., less than 2 meters long.

4. Tents should not decay when stored because they should have a minimum life span of five years without degradation.

3.4.2.7.2 Physical Specifications:

1. Tents should be appropriate and safe for full-time occupation by a family. This means tents should have a usable area of 3.5 square meters per person; 21 square meters for a family of six, 17.5 for a family of five, and 14 square meters for a family of four.

2. Tents should be set up in a form appropriate for constant use: This means that 33% of the total floor area should have a minimum of 1.8 meters head height.

3. Tents should be durable in their structure and their covering. Both parts should be capable of 18 months of continuous usage. This means that the covering must maintain its structural strength despite UV exposure and that its structure should withstand temperatures of

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[24] The Shelter Project includes a group of five donor organizations, five United Nations entities, the International Committee of the Red Cross, and eight non-governmental organizations. Some of the donor organizations are: ECHO, JICA, and USAID. Some of the UN entities are UNDP, UNCHR, UN/OCHA,UNOPS. Some of the NGO'S are: MSF, OXFAM GB

26 to 45 degrees Celsius without deteriorating during that period of time.

4. The structure and covering of a tent should be able to withstand the most extreme weather conditions that can reasonably be expected. This means that the structure of a tent should have enough redundancy so that if one component or fixing fails (understanding the term "component" to mean any structural member, joint, covering, liner, guy rope, peg or groundsheet), the structure will remain erect. This also means that the structure must not fail in wind speeds of up to 100km/h and that water should not leak through the covering under any conditions.

5. Tents should be supplied with appropriate ground sheeting or flooring. This means that water should not leak through the ground sheeting under any conditions. Insulating flooring, rugs or mattresses should also be offered to tent beneficiaries in temperatures averaging below 0 grades Celsius at night.

6. Tent ventilation should be adaptable to the beneficiaries. This means that doors, windows and vents should be easily opened to control heat gain or loss. An opening in the tent should also maintain minimum ventilation to prevent suffocation and reduce risk of morbidity as a result of air pollution and transmissible disease.

7. Tents should follow strict fire safety codes. People should have enough time to escape from a burning tent. This means that the design should allow people to exit from the tent within two minutes even when all doors are fully closed, and that the flame from a cigarette or match should not spread across the entire covering or structure.

8. Tents should guarantee strict vector control. Measures should be taken to protect inhabitants from mosquitoes, flies and other disease-propagating insects. This means when they are used in tents, mosquito nets should be sealed at the ground and cover all openings.

9. Tent-component materials should not be toxic to manufacturers, inhabitants, or the environment. This means that they should not contain or be produced with any toxic materials that may harm either the producers or the local environment.

10. Tents should be of an appropriate color, both inside and outside. Cultural and political sensitivities should be taken into account. Military and camouflage colors should be not used. Tents must admit adequate daylight for reading.

3.4.2.7.3 Social Specifications

1. Tents should arrive with instructions illustrating how to assemble and maintain them, in graphic or pictorial form and, if possible, in the beneficiaries' language. The instructions should be include with the tent, printed on the outside of the bag.

2. Tents should be easy to put up or build without instructions. It should be possible for two adults to learn how to put up the tent within two hours.

3. Tents should be reparable by beneficiaries and allow occupants a reasonable degree of adaptation to better suit their needs. The number of different components should be kept to a minimum and should be interchangeable whenever possible. The components should either be available locally or appropriate materials, tools and skills should be available to manufacture them locally. Repairs should be possible with non-specialist skills and equipment. The tents should also come with a repair kit, appropriate tools, spare parts, and other necessary material.

Some of the component materials used should be suitable for later re-use, upgrading, modification or reconstruction after return.

4. Tents should be adaptable by beneficiaries and allow occupants a reasonable degree of application to better suit their needs. The minimum number of obstructions should be placed in entry areas to make the adaptation of space for child care and cooking easier.
Common patterns of adaptation of tents should be considered and supported in the design of the tent, including mud brick walls.

5. Tents should be modular. It should be possible to connect tents together easily, so that more than one tent can be distributed to accommodate larger beneficiary families. In order to be able to do that, there should be connection points in the covering and in the structure so as to facilitate connection to other tents of the same type.

It is also important to take into account the question of adaptability for use with other types of tents and for expansion or upgrading of the tents with locally available materials.

6. Tents should provide a suitable level of privacy for the individuals living within the tent and, whenever possible, sub-divide the internal volume i in order to increase its visibility.

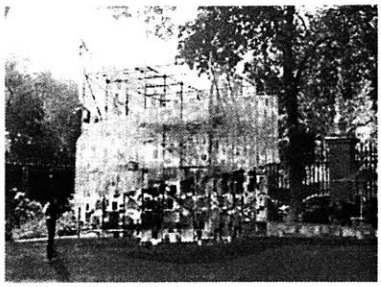

Figure 55– Kieran and Timberlake's` SmartWrap

The range and use of the standard family tent fails to reflect the fact that the sizes of families differ. Future developments with respect to tents must consider the potential for physical adaptation beyond the initial or intended lifespan.

3.5 Contemporary Approach: Comparisons among different types of Mobile Architecture

Upon understanding different types of as a "genre of building" one begins to look into its different variations, which opens one's mind to the question of just what emergency housing for refugees should be from the designers' point of view, since it freely considers far more possibilities that those of a conventional agency, due to the performance restrictions proper to this type of building.

In the conclusions of the previous subchapters, it was claimed that what is conventionally offered by relief agencies such as Oxfam and UNHCR is a collection of multiple static solutions that cause a rupture in the recovery process or a "bouncing back" momentum in the displaced community. What they "accomplish" through the aid they receive is a complete rupture in the evolution of the recovery process. They divide it into the following three "stages": emergency, temporary, and permanent periods, without considering that what is offered as a first-aid solution should ideally be part of the final settlement.

The intent of the following sub-chapter is to compare a set of ten different case studies of very different types of "mobile architecture" or spatial solutions. They range from conventional emergency-housing solutions in which the shelter is architectural and grounded on a "fixed" place, to more experimental examples where the space is created, not by an architectural piece, but by the interaction of an urban nomad and an object. In the latter case, the building, far from being an external, foreign element, becomes an extension of the user's body.

The case studies to be compared are: Kieran and Timberlake's *Smart Wrap*, Icosa Valley's *Pods*, Gans and Jelacic's *Kosovo Emergency Housing*, conventional relief agencies' *tents*, PO.D *Instant Ego* and *Nomambule* prototype dwellings, Michael Rakowitz' *Parasite*, Nader Khalilli's *Superadobe,* Shiberu Ban's *Paper Log House* and Lucy Orta's *Refugee Wear.*

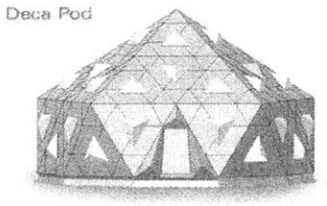

Figure 56– Icosa Valley Pod

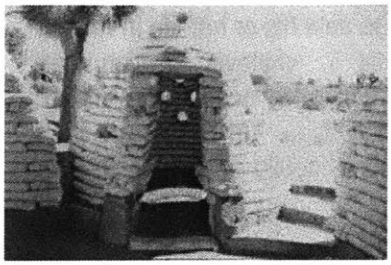

Figure 57– Superadobe

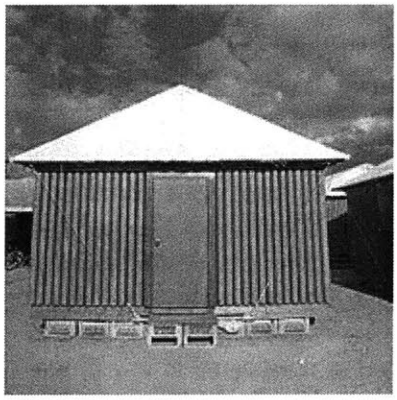

Figure 58– Paper log house

Innovation: Concepts, Materials and Structure

In order to compare the case studies mentioned above, it was initially necessary to establish eleven comparative parameters: general description, dimensions and weight, materials, number of parts, area, structure, strategy, number of people required to assemble, tools needed, environmental issues, and innovation lessons. Once their general characteristics were understood and a clear idea of their performance obtained, they were rearranged into three groups according to their scale. Nonetheless, the question still remains: Are they closer to being buildings or are they closer to being objects? With this concept in mind, the "buildings" were first compared within their categories so as to obtain a precise set of statistics that helped to compare them later among the following three different categories: architectural cases, architectural extensions of the body, and space--invaders.

3.5.1. Architectural Cases: Agencies' tents. Icosa Valley *Pods,* Nader Khalili's *Superadobe* and Shigeru Ban's *Paper-Log House.*

These four cases share two things. One, they respond to what is normally called "shelter" in the sense that they create space in an enclosed place. Two, besides the conventional agencies' tents, they are both "environmentally friendly groups". Their structures are made of recycled materials that can also be easily reused and disposed of. However, despite these two points which they have in common, they cannot easily be grouped in the same category since they have different physical and technical characteristics.

For instance, Khalili's super-adobe structures use only sand-bag and barbed-wire technology as their main component, with a minimum amount of purchased parts and a maximum use of cheap and readily available material. In contrast, the conventional agencies' tents use canvas, frames and poles, thus eliminating the possibility of using local resources and thereby increasing the final costs of transportation and construction.

Another comparison that can be made in this category is that between the two projects that use recycled paper as their main material and structure, Ban's Paper Log House and the Icosa Valley Pods, with the conventional agencies' tents, where the shelters are composed of a separate set of frame and canvas. In the first two examples the skin is the structure and the use of bolts and joints is avoided. In the last case, a traditional architectural point of view continues to be applied in which the structure is separated from the skin and the two elements are used separately.

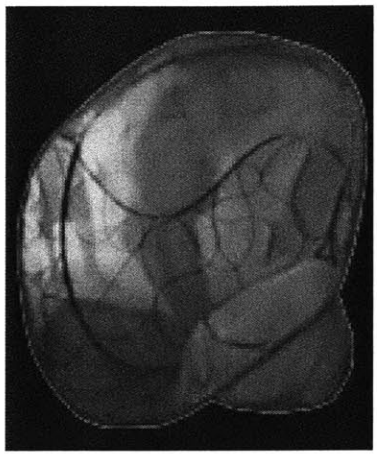

Figure 59– PO.D Instant Ego

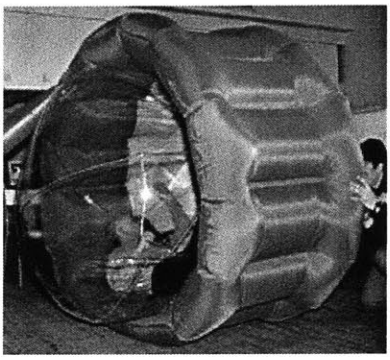

Figure 60– Nomambule prototype

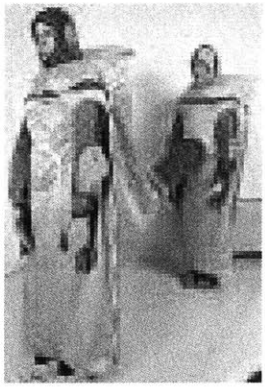

Figure 61– Lucy Orta Refugee wear

The advantages of using a single element both as an external envelope and as a structure are economy of elements, minimum deployment time and maximum material performance. Layering using environment-friendly materials is an element that should be considered for any emergency shelter solution.

3.5.2. Body Architectural Extensions: PO.D's *Instant Ego* and *Nomambule* prototype dwellings and Lucy Orta's *Refugee Wear.*

These three projects share the fact that the "shelter" is carried by the user. The user is an "urban nomad" who sets his or her life in motion "taking their home and working space to whatever location they desire"[25] or, in the refugee case, to whatever location they need. "Today's nomads need never pack their bags. Their house is their suitcase. No matter where they take their mobile dwelling unit, they will always feel at home."

The comparison of these three cases shows that, besides the fact that they permit the user the possibility of taking control of the deployment of his or her house, they also demolish the boundary between the concepts of what architecture is and what an object is. These nomadic creations can be defined as both "buildings to wear" or "clothes to live in".

It is interesting to see how these examples have used pneumatic technologies in order to save space in dwelling transport. The fact that the dwelling can be folded or rolled up gives the users flexibility regarding how and when they want to use their spaces.

One point that has not been mentioned or considered in any of the solutions mentioned herein is the fact that such dwellings can be made from different materials and not necessarily just from plastics. They are more concerned with a direct relationship to the body between physical and virtual spaces than with a practical housing use.

The lesson to be learned from this group is how a building can evolve like a living element over time, while having different uses throughout the period of its lifetime, and to see that this logic does not compromise its performance in any way.

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[25] Smith, Courtenay. *Xtreme houses*. Munich: Prestel Verlang, 2002

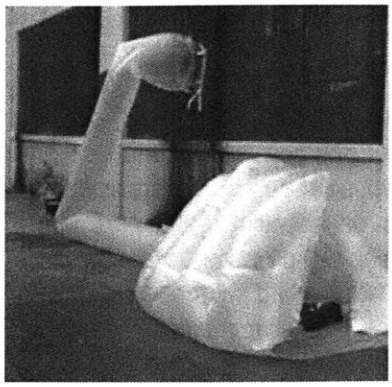

Figure 62– Michael Rakowitz' Parasite

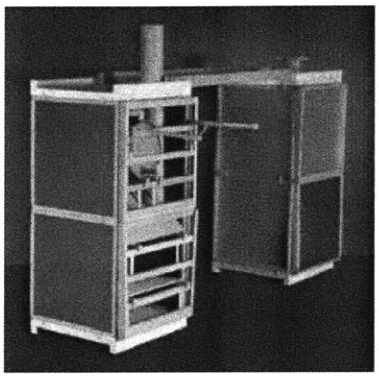

Figure 63– Gans and Jelacic image 1

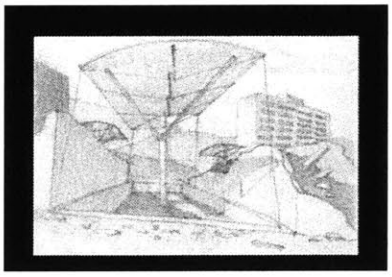

Figure 64– Gans and Jelacic image 2

3.5.3. Space Invaders: Michael Rakowitz' *Parasite* and Gans and Jelacic's *Kosovo Emergency Housing.*

"Why not breathe some life into dead urban and suburban spaces by inserting homes into unused gaps? Real estate is always at a premium so find a space and cling to it. Adapt to your neighbor's living space or make room for your own by latching into theirs." [26]

One characteristic that these two buildings have in common is the fact that instead of actually build a new architectural settlement, they plugged into already existing buildings. In a sense, they combined the environment-friendly approach and the flexibility of the previous two groups.

In the case of Michael Rakowitz' Parasite, in addition to being an element that is carried by the urban nomad, it is also served by permanent buildings that are "alive". In the case of Gans and Jelacic's Kosovo emergency housing, they plug themselves into ruins and avoid building rigid spaces. This approach is very interesting, especially considering the fact that it offers the services that the "dead" building cannot offer during the period of recovery. It is also important to mention that this emergency housing approach fosters the momentum of recovery mentioned above and it is a piece that can be implemented again later in a more permanent solution.

[26] Ibid

3.5.4 Conclusions

With the comparison of these ten case studies, what I got was a collection of "successful elements" that improve the performance of each dwelling unit. Those elements helped me to set design criteria that along with the shelter project's performance categories and standards, *physical*, *logistical and social,* will allow me to design my own approach to emergency housing that quoting my thesis proposal "*will help to resolve the common dilemma of immediate help vs. permanent solutions by offering an element that will be present during the whole recovery process"*

Those points are:

1. The Emergency dwelling should be made of a single skin, which increase performance by avoiding unnecessary joints, and allows multiple uses in different scales. (Body scale to the building scale).

2. The Emergency dwelling should be made from a flexible material, which can be easily transported, easily assembled, made from environmentally friendly materials, and if it's possible from local resources.

3. This flexible material should have other advantages besides of its mobility. It should offer other services, necessary during the recovery process. This material should be a phase change element that behaves according to its environment. It also should be dynamic, having imbedded additionally intelligence. (For example the SmartWrap's OLED's).

3.6 Chapter Summary and Conclusions

The situation is different in this chapter. Once the problem of emergency housing in Colombia is detected, the ways in which the same problem is dealt with in other parts of the world are examined. In examining the problem in a broader context, two things are observed: i) at the moment of providing aid, the agencies are guided by myths that unmistakably affect the quality of their intervention. ii) It is clear that over and above local solutions, tents still continue to be the number one preference on the part of the agencies, whether it be for logistic or economic motives.

In this way, the main objective of the first part of this chapter was, on the one hand, to examine the realities vs. the myths when providing aid so as to obtain lessons about what is really needed in the field and, on the other hand, through the study of the different types of tents, of the materials used and of the context in which they are used, to learn the standards of their performance so as to be able to apply them later in designing the material solution mentioned in chapter two.

In other words, to understand their materiality, how many layers they have, whether they are single fly, or double fly etc., where they are located, what they are made of, what quality of space is generated in them, etc., so as to be able to see in the abstract the performance requirements not so much of the tents in themselves as those of an emergency space as such.

Once this point is defined, i.e., what is needed is a skin to accompany the displaced person during the process of recovery, the different types of Contemporary Approach are compared by looking at different types of mobile architecture in order to obtain ideas about what can become the ideal of a skin that accompanies the IDP during the process of recovery.

Key Points:

1. Tents, after clothes, are the layer closest to the body.
2. Sheltering is a continuous process. Therefore, any solution that tries to provide shelter in the wake of disaster should be flexible enough to adapt to the changes of the users.
3. The ideal flexible solution to provide shelter following disaster should be something that accompanies the IDP during the recovery process.
4. A textile-form object rather than a tent could be a solution. The lesson is to analyze tents started in a different way, analyzing it more

from the material perspective, as a continuous set of layering rather than just as a static object

5. Instead of supplying tents, igloos, etc., donor agencies can supply material items that can be incorporated into the self-recovery process.
6. In the case of the Colombian refugees the material could be a textile-like, smart skin made of local resources.
7. This not only fosters recovery but generates local employment as well.

CHAPTER 4: SKIN AS A SURVIVAL MATERIAL

4.1 Introduction

As discussed in the previous chapter, emergency housing may at first appear to be a simple element whereas, in reality, it is a highly complex subject with a very complicated program. Among all architectural typologies, this type of building is perhaps the closest in scale and in material representation to the body. Given the complexity of providing adequate emergency housing, the tents may be considered more as skin layers, a natural evolution of the dress, and an expansion of personal space rather than just an edifice.

In this chapter, the emergency housing envelope is going to be closely investigated from the phenomenological perspective, in order to establish a clear connection between personal constructions of space, and material representations of it. In other words the idea of this chapter is to explain how emergency housing can almost be considered the second skin of the human body, through the use of textiles in an architectural way. The title of this chapter gives a hint of that connection. The envelope ultimately behaves like skin that protects the refugee's body.

This chapter will be subdivided into three parts: The first part will talk about constructions of personal space from three different points of view, as an introduction to the concept of transfer the idea of place into a non fixed site. The second part will give a brief introduction to alternative approaches to small scale architecture or architecture as an object, through examples of surface and material treatments in both modern and vernacular architecture. The third part will illustrate the relationship between architecture and textiles; from the classic point of view, like that of Gottfried Semper, to contemporary approaches, like that of Issey Miyake among others.

4.2 The act of dwelling is the act of passage[27].

Robert Kronenburg in his article "*Modern Architecture and Flexible Dwelling*" carefully explains the concept of place-making. Through various examples he argues that place, and by association home, is not necessarily achieved by the creation of a permanent building. For him, the essence of place is supported by essential acts of existence. To quote Kronenburg, "*When we arrive somewhere different",* referring to a tourist who arrives to a hotel room," *we "create" a new*

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[27] Heidegger Martin. "Building, Dwelling, Thinking" (1951) in David Krell, ed., *Martin Heidegger, Basic Writings*, London 1993, pp. 355-56.

home by endowing it with our presence in the form of the interior landscape of our possessions. It is not only the familiarity of these possessions that defines our identity into the adopted space, but the way we distribute them." [28] This idea of place-making could be applied in the case of displaced communities: Although said communities are not nomads by choice, when they arrive at a refugee camp they repeat this appropriation pattern as a survival element. According to some refugee bibliography and personal experience on the field, examples of these appropriation behaviors are evident in almost all refugee camps; when the community members place their personal objects, besides having some of them for practical reasons, the message of placing those objects into any part of the space is, "I am still alive, and my objects are witness of this".

Another example that is worth mentioning in order to support this argument, that place is not necessarily achieved by the creation of a permanent building, is the way in which some cultures can create a *place,* or using Heidegger's term *locale,* by simple ephemeral acts. Just by binding encircling trees rocks in even an apparent "empty" locale with rope, fabric and paper, the Japanese define place. Therefore, the essence of place is not only created by building, a costly and time consuming act, but also could be achieved by movable and temporary artifacts and situations which ultimately are equally significant to the creation of a permanent home. In other words, for Kronenburg the act of *dwelling is the act of passage*; or using Paul Oliver words, *"Dwelling is both the process and the artifact .It Is the process of living in a location and it is the physical expression of doing so"* [29]. Let's keep in mind this central idea, since it supports the following statements.

4.3 Other Understandings of how to construct personal space.

Anther approach related to the personal construction of individual place is the one that Christopher M. King explains in his paper *The Suitcase: Postcards and Paraphernalia.* Although the main idea of the paper is to redefine the space of tourism and travel through the relation between physical and virtual space, there are some arguments directly related to the claim of the paragraph above. "*In the "technologically" dominated age of the World Wide Web, there is a danger of losing bodily experience of space. Since a person can virtually travel without leaving the intimate home space, the relation between the virtual ubiquitous world of the net and the physical space*

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[28] Kronenburg Robert, *Living in motion: Design and architecture for flexible dwelling,* page 21
[29] Oliver Paul, *Dwellings the house across the world,* page 15

blur the "real" location of the individual. Home serves the individual as a place to "withdraw", to screen out or to "exclude" others. "[30]

According to that argument, the conventional house as we understand it, it is no longer a viable mode of habitation, since the body could be engaged in different planes at the same time, blurring the real location of the individual. For that reason, the mental and physical body needs a "traveling habitat" flexible enough, to allow its navigation of public virtual space, while maintaining the boundaries, which secure the personal space of an individual. Since the "experience" of travel could be virtual or physical, King's argument is that the kinetic body needs a "movable home"; Using his words *the user need "a flexible traveling unit", an "elastic container", capable to interact, stretch and transform in direct response to its use. In order to visualize that ideal portable traveling unit*, King compares it with the typical tourist suitcase, *"which reveals its journeys with an airport destination tags, rips and tears, and changes in its contents".*[31]

Therefore, this ideal "portable unit" should have, like the tourist's suitcase, traces of its journey; Illustrating not only the personal space of the individual but also the boundaries of such space. "*Objects which become part of the emblematic collection and authentication of a journey alter the definition of personal space in a manner which gives a technical invention new meaning. The artificial relevance of these objects in direct association with memory, which is in a sense the way of construct space, becomes important to the tourist much in the same way as valuables do to a homeless person."*[32]

Therefore, for the homeless person, as for any other urban nomad i.e. IDP's, paraphrasing M. King "*the prescribed value of memory lies embedded within the things an individual procures through his journey. The "value" oscillates between the object utilitarian function and the manifestation rule space defines by an intern's value. Because there is no permanent construction that allows for the simultaneous use and storage of objects, there is mixture between these stages of storage and stages of use. Choosing the contents of luggage for a journey becomes equally important as what is picked up along the way, therefore invariably redefining an individual's personal habitation within the public environment."* [33]

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[30] King Christopher, *The Suitcase: Redefining the space of tourism*, pg 37
[31] Ibid
[32] Ibid
[33] Ibid

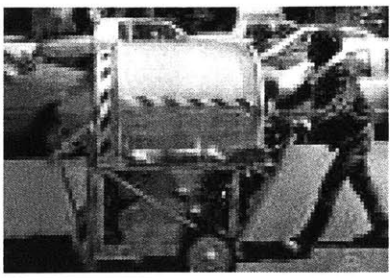

Figure 65– Critical Vehicles Project

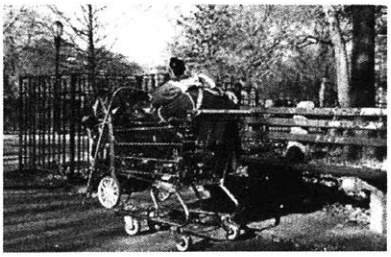

Figure 66– Image of a homeless in NY with a shopping cart

Housing and survival methods developed by the homeless in the urban environment have been both innovative and relevant to the subject of tourist travel. The crucial area of discussion covers a range of everything from the question of appropriation of the object to the construction of a shelter and the localization of personal space, all on a portable basis. We can see how the shopping cart serves as a source of mobility for the collapsed inhabitants of the resident tourist. This acquired vehicle provides the individual with the qualities of a room within an urban climate without the permanent occupancy of a real site. The cart comes to represent the boundaries of the individual's space, the container of her/his objects. Here we can start to assess the power behind the notion of a journey represented by the things collected and comprehend the idea of the *object as a tool which creates memory and therefore value.* Personal space in this case is constituted by the storing, use, and daily routine of each item that accompanies the person on his or her daily meandering. Surely the choices of what items are included in this portable unit are not decided solely on utilitarian value, although this is important as well.

An example of research on construction of space by the homeless can be seen in Krysistof Wodiczco's work with the homeless community in New York City. In his book *Critical Vehicles*, he presents different examples of their construction of space along with a personal critical design of a shopping cart, the homeless person's main "space-vehicle", as a way of "*making visible and strengthening the modes of cooperation and independence that exist in the homeless population".* For him, homeless people, like other types of nomads *"are not detached from their terrain, but in fact they try continuously to affix themselves to it, and must know the characteristics of the terrain to do so."* He proposes three sets of projects in which the urban nomad, or the Inner Displaced, the homeless, the foreign or in other words "the other", uses different prosthetic devices in order to be acknowledged by their societies.

Since, according to Kronenburg, personal space could be constructed of ephemeral acts of living, and according to King, the body needs a different type of container flexible enough to be the object that carries and is carried both in the case of virtual travel and homeless' journey, IDP's could be placed in a space in between, since like the virtual traveler, the tourist and the homeless, they are forced to leave their lands with the only option of construct their home from themselves, their bodies, their most precious objects, and memories. Considering that the layer that corresponds to their dwelling disappears, new interior layers emerge from them, creating a mobile habitat. Here is where the skin constitutes their closest living space. My argument is therefore to reproduce through textiles "the skin" of the IDP's living

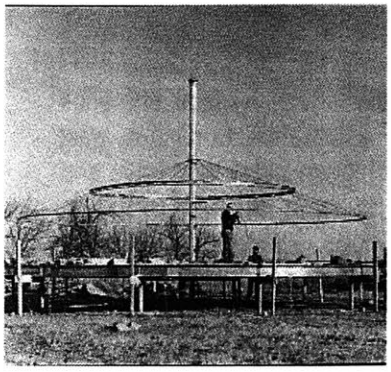

Figure 67– Wichita House: part of the Dymaxion House series: Erection of the mast from bundled tubes and suspension of the network of supporting rings

Figure 68 – Cladding the structure with thermal foil inside, aluminum sheeting outside

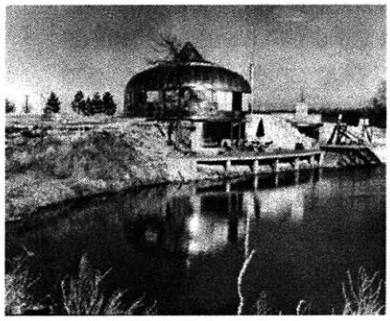

Figure 69

place, reinventing it; no longer using the tent as we know it, as dwelling unit.

4.4 Modern Approach to Mobile Dwellings

Rather than being a specific geographical location home is more about a set of personal activities, habitats and relationships than established a continuum of habitation in the same location. A central concern of modern movement was to increase the dynamic qualities of the home environment, whether by means of flexible floor plans with flowing rooms' sequences that were adaptable to a variety of uses or with the help of multifunctional interior objects. The idea of utilizing industrial techniques to make individual houses remained a particular preoccupation of the post war years, especially in North America. The primary legacy of the modern movement mobile house designs and 60's experimental critical approaches was inquiring into the most basic human necessities, looking for mobile, low cost and highly efficient dwellings. Taking advantage of modern construction techniques inherited from post war aircraft and weapon industries, famous architects and product designers proposed experimental units that later influenced architecture. Walter Gropius was the first example of that. In his design-research oriented work, he worked on several projects for factory built houses in years before World War II. Gropius argued that modular building techniques offered society economic and aesthetic benefits that could be compared to the design and manufacture of clothing. He believed that although such buildings utilized a limited range of materials and components, with a modular approach sufficient individuality could be incorporated into each separate dwelling. His experimental houses were exhibited in 1927. He concentrated more on exploring the making of rather than the aesthetics of mobile dwellings.

Anther example of experimental houses was Buckminster Fuller's Dymaxion series: The Dymaxion House and the Dymaxion Deployment Unit among others. The Dymaxion House was certainly the most famous example of a house design that focused on mass-production, "low cost" and lightness of materials to achieve high quality, individual dwelling environment for large numbers of people at affordable cost. Although it was only a prototype, it showed the appealing "advantages" of a prefabricated system and their promise to offer greater economy, speed of erection, reduction in skilled labor on the site, and a higher quality product due to factory manufacture. It was an inspiration for radical light architecture.

The last two examples represent early medium-scale explorations on an architectural level; the next two examples move from the scale of the building to the scale of the object.

4.4.1 Archigram

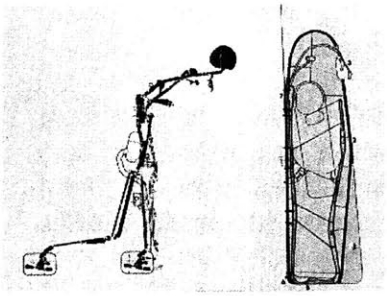

Figure 70 - Cushicle

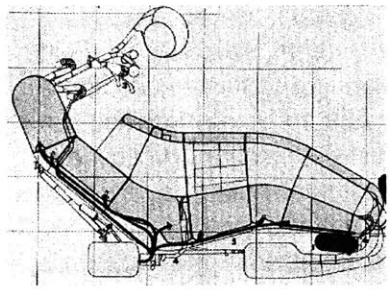

Figure 71

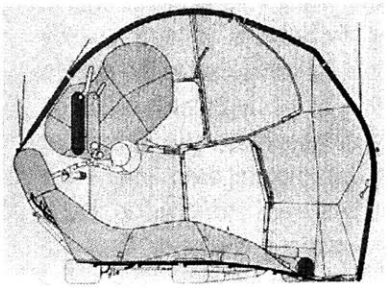

Figure 72

The shock waves of the 60's were characterized by their crusades against the means and ends of the establishment. Unlike past architectural and artistic movements, Archigram used new ways and methods of protest as a way to react to static old approaches to architecture and its material representations. Therefore, instead of composing a manifesto that, according to Arata Isosaki, was "a relatively easy task", Archigram, through its theoretical projects and writings radiated stimuli to the senses over a prolonged period of time. The Archigram journals directed a virtual shower of projects to the entire world over a ten-year period, establishing *"a special attitude towards change and mistrust to definitive architecture"*, a new structure of values and syntax which demonstrates the possibility of an independent subculture.

Archigram inquired into design by experimenting with gadgets and plastics; new techniques and materials from pop culture. Their work, like that of other radical architecture groups of the 60's, was concerned with the development of ideas about new forms of architecture for a revolutionary way of life. Based on futuristic views, they proposed bold projects on urban and architectural scales. On the urban scale, they proposed a scheme of urban life and instant cities that would supposedly generate, reflect, and activate life through a structure organized so as to propitiate life. On an architectural scale, inspired by NASA spacesuits and survival capsules, they proposed the design for mobile personal spaces for the urban nomad as well as capsule equipped-dwellings ready to plug into a power grid (Cushicle), and a set of living mobile environments pared down to minimal bubble dimensions (Suitaloon).

4.4.1.1 Projects

Cushicle

The *"Cushicle" w*as a one-person autonomous environmental suit that enabled the explorer or the wanderer to travel anywhere in fully serviced comfort with minimum effort. It consisted of two parts: the armature, which supports appliances and whatever other apparatuses are required, and the enclosure or inflated/enveloped screen which is reacted re-inflated according to users' needs whenever required.

With the establishment of service nodes and additional optional apparatus around the city, this unit could develop to become part of a more widespread urban system of personalized enclosures. In summary this project provided the environment for the rider, like a

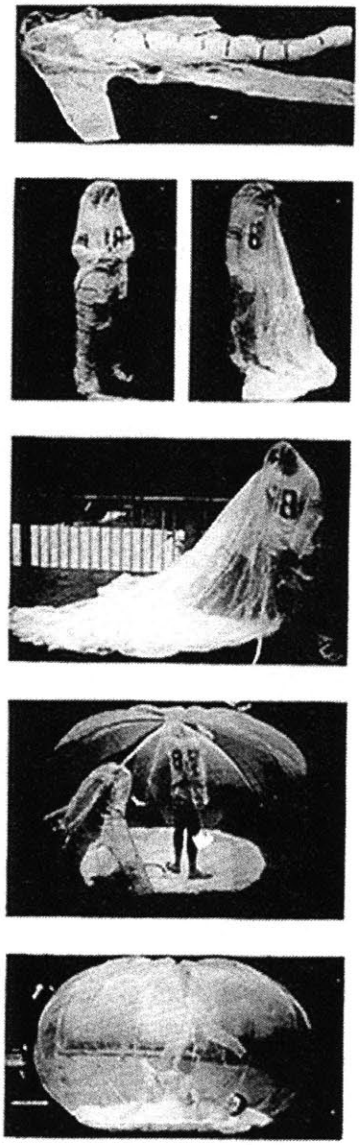

Figure 73– Suitaloon

mechanism for a car. It also can be attached to optimal extras such as an engine and wheels to convert it into a personal vehicle.

Suitaloon

This project was a further development of the previous concept. (The design of a pneumatic home, one worn like a suit, which inflates when required.) This time, Michael Webb went further; in this case, the "space suit to live in" provided itself all the necessary services, movement, space and power to convert it into a minimal house.

4.4.1.2 Conclusions

These experimental designs did not influence mainstream architecture immediately, since they were reactionary. However, after some time many ideas and concepts once considered stimulating and exciting, though impractical, suddenly seemed to have viable applicability in other fields.

What has shown to be valid in the last examples mentioned here is the constant search for flexible habitation schemes. The continuous search for basic living spaces have enabled the people involved to understand what the essential elements for survival really are.

The fact that it is a bubble-type, textile-like surface rather than a fixed element is the most important point in this case.

These unconventional environments can provide completely new spatial experiences for meditation, mind-expanding experiences, or simple enjoyment, and what they have all demonstrated is that a house is a work in progress.

4.5 Vernacular Approach

Figure 74– Eskimo hunter in the process of building an igloo

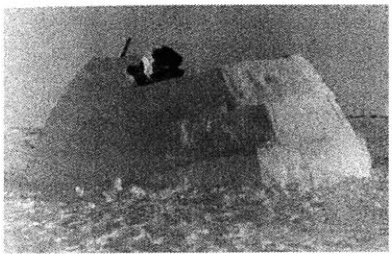

Figure 75 – Constructing an igloo

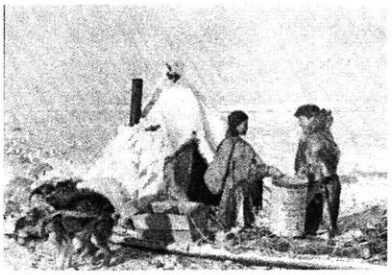

Figure 76 - Tupiq

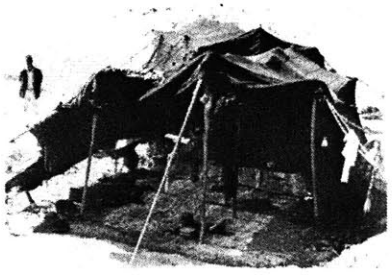

Figure 77 – Bedouin Black Tent

"The ability to move, change and adapt are unequivocal prerequisites for life, and this makes a look at cultures that have different relationship to nature than western cultures do particularly fascinating. Vernacular Dwellings are often perceived to be well made and aesthetically pleasing, yet at the same time, undersigned and unchanging. While most nomadic dwellings exhibit a versatility born of the need to be mobile, many permanent vernacular dwellings also exhibit a flexibility developed through the process of living in one place responding to local needs. Vernacular Architecture, in a sense illustrates creative use of local resources and ingenious building technologies." [34]

The aim of the next subchapter is to look at the most representative vernacular, nomad dwellings in order to learn from the way in which they make use of alternative materials in their approaches to outer skins.

4.5.1 Shelter of the Nomads

There are three main types of nomad dwellings: i) The snow houses of the Inuit or Eskimo people of the Arctic, ii) The Indian "Tepee" or "Teepee" of the North American Plains Indians, iii) the Black Tent of the pastoral nomads throughout an area that stretches from Mauritania and southern Morocco in the west all the way to Tibet in the east.

4.5.1.1 The snow houses of the Inuit or the Arctic Igloo

Distributed throughout one half of the polar world, from the Bering Strait and Alaska to the shores of Greenland, the Eskimo people have been developing clothing and dwelling systems for centuries that have given them the vital protection they need to survive in extremely severe climatic conditions. Evidence of this has been found both in the five-century old mummified Eskimo bodies discovered at *Qilakitscg* in Greenland where the bodies were ingeniously insulated with seal-skin clothes sewn with sinew and waterproofed with seal oil, and undergarments made from cormorant, duck and goose feathers, as well as with the four different types existing ice houses. Such clothing protected the individual; while the ice-dwelling or the igloo protected the family group.

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[34] Kronenburg Robert, *Living in motion: Design and architecture for flexible dwelling,* page 134

i) The Ice House

Used as winter shelter by the central Eskimos and as temporary shelter by the hunters, the igloo represents one of the most efficient forms of vernacular architecture invented to date. Using nothing more than the skins of the animals of the region and blocks of ice, they manage to isolate their users from the most extreme temperatures. Thus, in outdoor temperatures of -40 degrees, they manage to reach indoor temperatures of 15 degrees centigrade with the help of lamps and human warmth.

The method of construction is quite simple and it is the same regardless of the size of the building. First, a site is selected, testing the consistency of the floor with a fine caribou antler probe. Once this test has been passed, slightly curved blocks of ice are cut, measuring approximately 1 meter long by 0.5 meters high by 0.2 meters wide are cut. A five-meter wide circle is then inscribed and work is begun on building the first ring. One the first ring is finished, the following blocks are placed with a slight inclination on top of it, beginning a continuous spiral that ends at the top of the vault. It is worth noting that blocks following the first ring are placed in such a way that the joints do not coincide and they are cut in such a way that they are inclined inwards and supported by the previous block. In this way, the spiral continues with an inward gradient, thus preventing the dome from collapsing during construction. The work is done by two people. One takes charge of putting the blocks in place while the other cuts the blocks and fills in any space between the blocks with loose snow.

Once the vault is finished, work begins on the entrance and the windows. The entrance is done in one of two ways, by means of a subterranean tunnel or by means of an angled tunnel. Whichever form is chosen, the perforation is small and covered with a grizzly bear skin to prevent the entry of cold air into the igloo.

Inside the igloo, it's a different story. An elevated platform is build to isolate the occupants from the cold. Several layers of skins are stretched out on top so that the inhabitants can rest on it. The walls of the building are covered with caribou skins, thus creating an additional layer of thermal insulation. It is important to note that a small orifice is perforated in the wall of the vault in order to ensure circulation of the air inside.

Three techniques are used to make the windows. The first is done by opening another orifice, arched this time through the dome over the entrance, and a translucent layer of knitted seal intestines is then placed in the perforation. In the second case, a block of transparent ice, which is given its shape inside a sealskin bag, is put in place. Due

to the fact that the bag is curved, the piece of ice that comes out fits perfectly into the curvature of the igloo. With the third technique, a block of ice is cut in any one of the sides of the igloo is withdrawn or put into place depending on the users' need for light or air at any given time.

Unquestionably an extremely efficient form of dwelling, the snow house was devised from the most economical means possible. The vault is constructed without formwork through the use of spiral and chamfered blocks, while the dome offers maximum volume with minimum surface area. Moreover, the dome has no internal corners or areas where pockets of cold or stagnant air can form and the contours permit conservation of heat and energy and help to maintain the circulation of air as well. Moreover, the internal skin allows a volume of air to be trapped between the hides and the internal surface of the igloo, thus preventing the snow shell from melting with the build-up of heat within.

4.5.1.1.1 Other types of igloos

4.5.1.1.1.1 *Anegiuchak*

This type of igloo used on the Arctic coast of Alaska is also made of snow blocks, but the shape of the building varies. It is based on a square plan rather than a circular one and has a gabled roof on top of which loose snow is piled.

4.5.1.1.1.2 *Killegun*

The ***Killegun*** is a temporary structure made of block walls dug out of the ground snow. Grounded in a one-meter deep hole, this type of dwelling is very different from the two types of snow houses mentioned previously. Instead of being made completely snow blocks at ground level to form a dome, the *killegun* is built in a big hole with ice walls that rise with the surface of the snow. There is a ridge pole in the interior that is used to support a canvas roof and a tent is pitched inside which works as a double insulation system.

4.5.1.1.1.3 *Tupiqs*

The ***Tupiqs*** or summer houses are tent dwellings constructed of slender poles made of pieces of antler or willow wands lashed together. Paraphrasing Oliver, "Two pairs of crossed poles, the smaller ones at the entrance and the larger at the front edge of the dwelling, formed the basic elements, with an arc of poles defining the back of the tent and resting on the fork of the rear crossed supports. Between the two pairs of crossed poles ran a ridge-piece and the

whole frame was covered with a tight-fitting membrane of seal skin or hide. In form, therefore, it is related to that of the igloo in both its snow and sod types, and is higher and more spacious at the *iqliq*.

4.5.1.2 The Indian *Tepee*

The Indian ***Tepee*** was once the typical dwelling of the Indians of the North American Plains. Made of tall, straight, wooden poles inscribed into an egg-shaped circle of 15 feet in diameter, this type of dwelling is usually made from lodge pine, hide covers, ropes, stakes and pins, with a skin of five or seven buffalo hides stitched together with sinew and stretched over a framework of poles. This framework is supported by a tripod of extra-strong poles that are tied together at the top. Arranged in an asymmetrical cone-shape to allow more headroom and to permit better ventilation as the result of an off-center smoke hole.

4.5.1.3 The Black Tent

Used in temperate and warm climates of North Africa, Saudi Arabia, Iran, Afghanistan, and eastern Tibet[35], ***The Black Tent*** can be described as a dwelling made of strips of cloth sewn edge to edge and held in tension with guy ropes and stretched over or between a number of poles where the covers can be detached from a dismountable supporting structure.

There is a wide range of variations in form and technique within the ***Black Tent*** category, depending on the climate and the needs of the users. ***Black Tents*** are formally classified as either one of two main types: i) the high ridge type, which includes the tents of Morocco, and ii) the box-like type tents, of which ***khune*** of the *Bassen* are an example.

4.5.1.3.1 The High Ridge Tents

Designed to withstand rain and even snow in some cases, the high ridge tents are those most commonly used throughout the regions just described above. Made of woven goat hair, many tents of this type are stretched over a curved ridge piece supported by one or two poles which gives them their typically humped effect.

Like its relative, the igloo, skins are also used for insulation in this type of dwelling. Contrary to what one could imagine, the black goat hair helps to keep the interior of the tent cool instead of retaining radiation. The natural oils in the goat hair are not washed out by dying and

[35] The Barber, Bedouins, Kurds, nomadic Pasterns and Tibetans

consequently the open weave, which permits the circulation of air, contracts tightly to form an impervious shield in the rare sudden rains, retaining heat as the temperature drops.

There are variations wiithin this category with respect to the way the strips of cloth are placed on them. In some tents they are stretched out along the entire length, for tension across the cover separating the strips at the seams. These are commonly found to the east of the Arabian Gulf; while North African tents tend to be strengthened by transversal, reinforcing tension bands of webbing which take the strain across the membrane.

4.6 Wearable Environments: Blur limits between architecture, furniture and clothing

"Multifunctionality and mobility are reflected not only in dwellings but also in the language used for specific terms for furniture. From Latin mobilis we have mobel and mibiliar in German, meuble in French, mueble in Spanish and movel in Portuguese. The philological relationship is especially close between terms from interior design and from clothing. The importance of textiles related to architecture was recognized by Gottfried Semper. The garment becomes the wall; the blanket is transformed into a roof, veils become wallpaper; the dress turns into paneling. Blanket, clothing, wardrobe, fence are likewise not symbols of language applied somewhat late to architecture, but a certain reference to the textile origin of these structural elements. The same connection exists in Romance languages: habitus means clothing, costume or habit, and habitare, habiter and habitar dwelling. In non-European, traditional societies, these relationships are easily recognized. In nineteenth-century Japan, quilted kimonos served as a bedspread. Mats made from cedar clothed the native peoples of North America's west coast, who also used them for bedding and for sails. The poncho or ruana shawl of the Andean highlanders is not merely a wrap to protect from the elements, but also a blanket to be used while sleeping in some cases. The same also applies for the large wraps used throughout Central and South America and in Indonesia and Africa for carrying children and goods."[36]

The quotation above explains the clear relation between architecture, furniture and clothing. As the title suggests, multifunctionality blurs the limits between those three fields. A piece of furniture can be a dwelling space. A piece of cloth can cover and transport an individual and store his or her belongings. A piece of architecture can be a cabinet. A basket can be a home. The need of the wanderer for mobile or itinerant spaces derives from the objects used the most.

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[36] Kronenburg Robert (Ed), *Living in motion: Design and architecture for flexible dwelling*

The objective of this subchapter is to delve into the points of convergence explained above in greater detail and to explore different theories about the common grounds between textiles and architecture, as well as to observe the continuous search for ways to create space within fabrics close to the body in the work of contemporary artists, fashion designers and critics.

4.7 Connection between Textiles and Architecture: Classical View.

Textiles and architecture are closely related and examples of common history can be found in numerous sources; from classic academic writings such as Gottfried Semper's 19th century text *The four elements of Architecture* and Anni Albers' essay, *The Pliable Plane: Textiles in Architecture,* to recent research papers, where architecture and textiles/fashion are linked in innovative and speculative ways.

The goal of this sub-chapter is to review the different approaches to finding common grounds between architecture and textiles, in order to establish different relations that will later support the idea of developing a textile-like building instead of a housing solution for emergency situations.

4.7.1 Gottfried Semper's approach to common grounds between Architecture and Textiles.

Perhaps the first author that started talking about the "unusual" relationship between textiles and architecture was Gottfried Semper, who saw a strong relationship between costume and architecture.

He established two main points of convergence between these two fields to illustrate that relationship:

i) How decorative symbols used in architecture have their origin in the textile arts.
ii) How the beginning of building coincides with the beginning of textiles

i) The Influence of decorative textile symbols on architectural style.

In his essay *The Textile Art: Considered in itself and in Relation to Architecture*, he argued that the principle of dressing had greatly influenced style in architecture and in the other arts, in all periods and in all nations.

To support that statement, he went back to the nature of clothing in ancient western civilizations; by studying the connection of costume with architecture in Hellenic and Egyptian cultures, he supported his claim, which ultimately points out that most decorative symbols used in architecture have had their origin in and have been derived from textile art.

There are three examples among the results of the extensive research he did on the subject that demonstrated the point: literal relations between garments and artistic representations. The first example was an ancient Greek writing by Ephesian Democritus. That document associated the luxurious dress of the Ephesians and the the prevailing system of colored ornamentation with general reflections on the orders and the decorative richness of their magnificent buildings. The second example was the way in which Egyptian capitals were decorated with inserts of flowers. They were adorned exactly in the same way the Egyptian ladies attached these flowers with stalks to their hair or behind their ears as head decorations; the third example was the Hellenic principle of incrustation. This example shows how the techniques used were reflected in clothing design. In this sub-chapter, we will explore how he inquired into classical relations between building parts and clothing.

ii) The beginning of architecture coincides with the beginning of textiles.

"The art of dressing the body's nakedness, if we don't count the ornamental painting of one's skin, is probably a later invention than the use of coverings for encampments and spatial enclosures."

Based on the study of the most primitive formal principles of architecture, in his essay Semper shows how textiles and architecture appeared at the same time before the art of dressing which, possibly due to climatic influences or other circumstances, was a later invention.

ii.a) The Relation between Textiles and Primitive Enclosures.

According to Semper, the pen or the primal enclosure and the interwoven fence are the earliest vertical spatial enclosures invented by man. Besides being primitive forms of delimiting space, both were made with sticks and branches bound together, like those of the Kuas Bushmen's *min*. In the second place, the fibers were interlaced, thus creating a continuous surface or mat without reference to secondary concepts.

Based on the above information, Semper affirms that the transition from plaiting branches to the plaiting of basts for similar domestic purposes was easy and natural. This transition led to the invention of weaving: first with blades made of grass and then with materials spun with threads made from materials derived from other vegetable or animal sources. After that technological loop, experiment with patterns, artificial preparation of materials, and different types of dyeing or knitting were invented for wall and floor covering.

"Whether these inventions gradually developed in this order or another matter little to us here, for it remains certain that the use of the crude weaving that started with the pen – as means to make home, the inner life separated from the outer life, and as the formal creation of space-undoubtedly preceded the wall, even the most primitive one constructed out of stone or any other material." (Semper, 1989, p.254)

According to Semper, the structure that serves to support, secure or carry out this spatial enclosure was a requirement that had nothing directly to do with the space, people used to build walls of textile sources or other materials for protection or defense, or to serve for foundations or for other practical reasons without having in mind the original idea of spatial enclosure.

In this connection, it was of the greatest importance to note that wherever body in the form of dress or shelter from these secondary motives were lacking, woven fabrics almost everywhere and especially in the southern and warm countries carried out their ancient, original function as conspicuous spatial dividers; even where solid walls were necessary they were only the inner and unseen structure for the true and legitimate representatives of the spatial idea: namely, the more or less artificially woven and seamed-together, i.e., textile walls.

4.7.2 The Anni Albers approach to common grounds between Architecture and Textiles.

Anni Albers, like Gottfried Semper, recognized the intimate relation between textiles and architecture. Although her approach was from the textile art to architecture, her conclusions were similar to Semper.

In her essay "*The Pliable Plane: Textiles on Architecture*", she established a set of three similarities between these two arts: i) material processes, ii) early uses and iii) structure.

"If the nature of architecture is the grounded, the fixed, the permanent, then textiles are its very antithesis. If, however, we think of the process of building and the process of weaving and compare the work involved, we will find similarities despite the vast difference in scale. Both construct from separate parts that retain their identity, a manner of proceeding fundamentally different from that of working metal, for instance, or clay, where parts are absorbed into an entity. This basic difference, however, has grown less clearly defined as new methods are developing, affecting both building and weaving, and is adding increasingly to fusion as opposed to linkage."[37]

With this quote, Anni Albers opens her essay questioning how architecture and textiles are perceived today. Although, as she says, these two arts possibly because of the difference of scale are seen as completely different fields, the reality is that they are not only similar but strongly related in their performance and history.

Both are very old crafts, older than pottery or metalwork. In ancient times, both born from the necessity of ancient individuals who went out from the shelters provided by nature. For that reason, before discovering material processes such as pottery or metalwork, humans worked with available materials such as skins, grasses, or plant fibers to build their own envelopes for their bodies and shelters. Thus in early stages these two arts had the common practical purpose of providing cover. Today, however, in the case of textiles this practical use is replaced to some extent.

As she explained in the quotation above, Architecture and Textiles share processes, since they in big or small scale are, a group of assembled parts that in a whole perform a common job.

After establishing that fact, she moved to the uses of both arts in ancient times, in order to establish their common ground of use. In early stages they had in common the purpose of providing shelter for the body: architecture for sedentary uses, and textiles for nomadic functions. Both were secondary skins that, in the case of textiles, gave individuals the freedom to be in any place, hour or season in both the distant past and today.

In early human history, Albers' said *"such independence* – (she is referring to the fact that individuals could move anywhere) - *surely brought on a further immediate need that a transportable shelter ";*

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[37] Danilowitz Brenda, *Anni Albers: Selected Writings on Design.* Wesleyan University Press. Hanover and London. 2000.

Thus textiles, the materials that proved to be suitable for clothing, could be made appropriate in each case. Its pliability and light weight made it an easily portable material for an efficient solution for a portable shelter. Its material characteristics when expanded could shed water, protect from the wind and provide shade, and be folded.

Albers adds another point. "*Life of wandering, not only what is carried has to be portable, but the means for carrying things have to be found and developed.* " On this point she went back to the textile scale and suggests how a cloth that is basically a collection of threads can form a structure to carry this minimum type of buildings.

Structure

Initial attempts to define textiles were mainly concerned with thread construction. This, on a smaller scale, is a process of structural organization, which is a process proper to the building arts.

Evidence of these experiments was found in the form of innumerable small pieces of cloth in northern Peru, which confirmed the fact that for ancient cultures, as well as for current designers, weaving, like building, was the art of mastering connecting parts.

In the case of weaving, mastering the art of connecting strings led to improve the performance of the materials. This improvement translated into an increasing number of textile use possibilities. Flexibility, pliability and high levels of performance in relation to their weight, were the parameters for a perfectly woven skin that protected the body from the elements either in the form of dress or shelter.

4.7.3 Contemporary Approaches

In the previous subchapters three different ways to approach the relationship between architecture and surface/textiles were presented.

The first part presented early modern approaches in which the relationship between the body and architecture at the scale of an object was examined. The second part presented different cases of vernacular architecture in which different vernacular surface treatments of textile or textile-related surfaces were reviewed. In the third part, classical relations between textiles, not only in terms of surfaces in general but in architecture in particular, were reviewed in an attempt to find a common ground between said fields.

The aim of this last part is to show alternative approaches to the relation between these two areas, not only in terms of finding common

Figure 65 – A-POC PIECE

origins but also in presenting the intersection between the scale of the textile object and the scale of the space that can be created within it.

The work of Eiko Ishioka and Iseey Miyake demonstrate that is not necessary to build an edifice to have architectural spaces between the body and the layers that cover it.

Eiko Ishioka.

The work of this choreographer and costume designer blurs the limits between clothing and architecture. Her work consistently points out her interest in creating an environment for or through the costumes she designs. Her work cannot be confined to either set design or costume design because the boundaries between the two dissolve in it; she allows the one to inflect the other.

This type of work is an inspiration for what could be done with the Arboloco Skin through the recovery process: folds and spaces within the textile and continuous surfaces that blur the limits between what an object is and what a space is.

Iseey Miyake: A-POC a piece of cloth.

Quoting from the article description *"On this work the Japanese designer continues to develop two themes that have long been present in his work: i) the manifestation of the process of making and ii) the original flatness of the material which he is working. The direct cutting-out which occurs liberates an item of clothing from a computer knitted tube. This process levels out the role of the designer relative to the costumer to some degree- the consumer becomes more actively engaged on the final realization of each piece as it is tailored for, or by, them once they have selected the fabric."*

Issey Miyake has revolutionized the traditional method of pleating by reversing the process, first cutting and sewing the fabric into shape and then pleating it by machine afterwards. In this way, Miyakee is highlighting the production process in a way that is related with what was mentioned in section 4.1. Miyake's work is thus an inspiration for research on arboloco skins since, on the one hand, it emphasizes that the IDP or the user is actively engaged in the final creation of the architectural piece and, on the other, that space can be created from a flat surface, either by making space by means of a textile which can sustain itself or by cutting it into pieces that can then be used to construct a building.

Chapter 5: Material Research and Exercises

5.1 Introduction

Figure 78– Image of an Arboloco Tree

Figure 79– Detail of an Arboloco

Before getting into the chapter on materials research and experiments in detail, it is important to look back at the previous four chapters and understand the logic that frames them.

The first chapter contains the introduction and the motives behind this research. A claim is made and the evidence and arguments that support it are presented.

The second chapter contextualizes the problem of Forced Inner Displacement. At first, the global scene, in which statistics show that Colombia is occupying first place in the number of displaced persons, followed by countries such as Afghanistan, Liberia and Angola, is analyzed. Then comes the analysis of Colombia and the regions of the country that have been most affected by the phenomenon. Under this sub-section, case studies on three IDP camps in the province of Choco are presented, in order to better understand the whole IDP phenomenon and to see how emergency housing for these communities is provided.

The third chapter discusses the current solutions for emergency housing in different parts of the world. The first sub-section explains aid agencies' policies, presenting the misconceptions about what is needed by the affected communities in an emergency situation. The second sub-section presents a comparison made by Cambridge University and the Shelter Project organization of different tent types in order to achieve an "ideal" tent solution. From there, performance "lessons" to be kept in mind when designing or making any proposal are obtained. The third sub-section shows different contemporary spatial solutions, not all necessarily related to emergency solutions, in order to understand alternative approaches to dwelling space.

To summarize the conclusions reached it can be said that what displaced people need more than a tent is an enclosure that is flexible enough to serve as an effective dwelling during the different stages of their recovery process, and that this need appears to be best served by a textile-like skin.

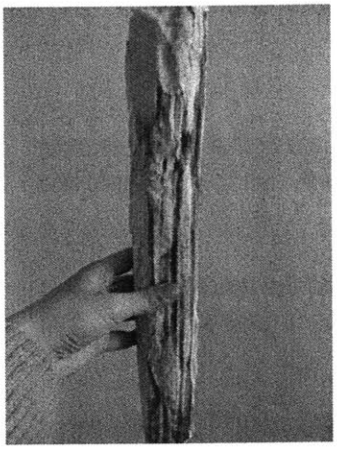

Figure 80– Image of a dried medulla

The fourth chapter illustrates a transition between the traditional ways of conceiving of shelter and the idea of place-making. This chapter delves more deeply into the concept of "skin" as an architectural element of enclosure, using examples that range from vernacular architecture to textiles as forms of architecture.

The idea of this last chapter is to continue to explore the line of thought of skin as an element that constructs space and to develop, through practical exercises with a local material known as arboloco, possible surfaces with that material alone or in combination with others, can ultimately create the ideal skin to accompany IDP's during their journey of recovery.

5.2 Areas of Encounter of IDP's and Arboloco

Zones of Arboloco

Zones of Inner Displaced Population

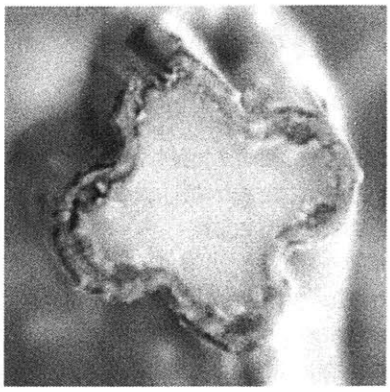

Figure 81

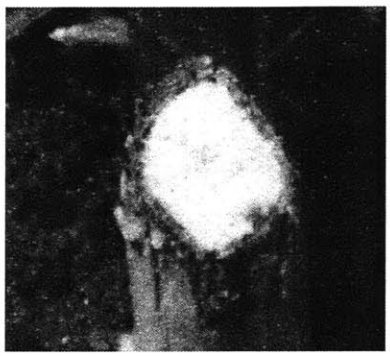

Figure 82

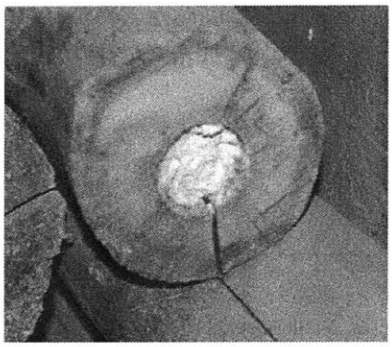

Figure 83

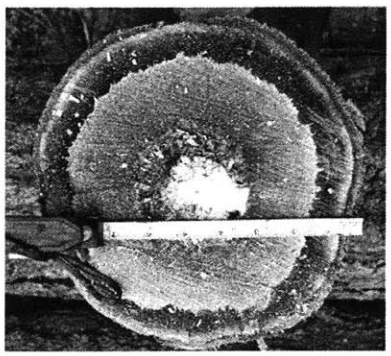

Figure 84 –The medulla initially takes up almost the total diameter of the trunk (Fig. 27 and Fig. 28). In adult trunks it takes up only a small portion of the central cylinder (Fig. 29) and this characteristic seems to be genetically determined to a great extent.

5.3 Material Characteristics

The Arboloco or "*Montanoa Quadrangularis*" is a fast-growing Colombian plant belonging to the sunflower family which grows between 1,400 and 2,500 meters above sea level. As its name suggests, the Arboloco or "crazy tree" is a plant that has unusual characteristics, not only with respect to its speed of growth, which is comparable only to that of the bamboo cane, but also in terms of the places where it grows and the irregularity of its shape.

The Arboloco cane consists of two basic parts: i) the trunk, which is the most widely used part, mainly for construction purposes; and ii) the inner medulla, for which no architectural applications have yet been found. The Arboloco develops to a wide range of thickness, depending on the genetic characteristics of the plant's population and its interaction with the environment. Thus, from 1/8 to 1/5 of the diameter of a mature trunk corresponds to the medulla, which has a cork-like consistency and is generally white in color.

The plant initially produces a single trunk, but after a couple of months various young stems grow out of the lower part, giving the Arboloco the appearance of being various trees. The original trunk can produce anywhere from one to fifteen stems and the height of both the younger stems and the first trunk ranges from four to fifteen meters. In some cases, it can reach up to 20 meters in height within the first twelve months. During this period, since the plant is in the process of development, the inner pith or medulla is in charge of growing and "feeding" the plant. In the tenth month, when the medulla's main nurturing role comes to an end, the trunk starts to develop inwardly, thus "eating" the young medulla. It is therefore advisable to cut it before that time in order to keep the pith fresh.

5.4 From plant to housing material

The medulla is obtained from the younger stems. The trunks and branches from which the medulla is extracted generally have a radius of between six and fifteen centimeters and a length of up to ten meters. The bark is 2 to 5 mm thick and the rest is medulla.

The medulla is separated from the bark with the use of a machete. This has to be done immediately after the stem is obtained in order to avoid dehydration. If the medulla is not separated from the bark at this moment, these two components adhere to each other and the quality of the pith decreases.

Figure 85 – Cross-section of Arboloco medulla.

5.4.1 Description of the Inner Medulla.

According to research from EMPA, "*...arboloco's Physical characterization confirms that the pith density of r0=0,035 gr/m3 is about five times lighter than balsa, known as the wood with lowest density. Due to its morphology, the porosity of the pith is extraordinarily high, indicating good thermal insulation capacities. This has been confirmed by the determination of water vapor transmission properties and thermal conductivity. Tab 1 compares the values of the pith tissues to those of common synthetic insulation foams. The biological material easily competes with the technical foams, the vapor diffusion values even range better because of the hygroscopic behavior of the cell wall*".

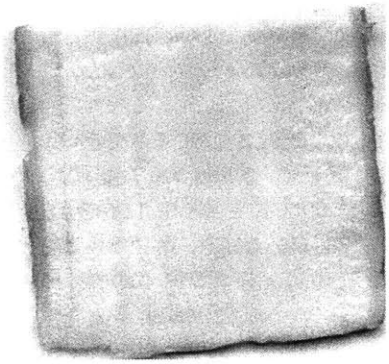

Figure 87 – Cross-section of Arboloco medulla. Nóte that this type of cut conserves the typical quadricular formationof the young parts of the branch.

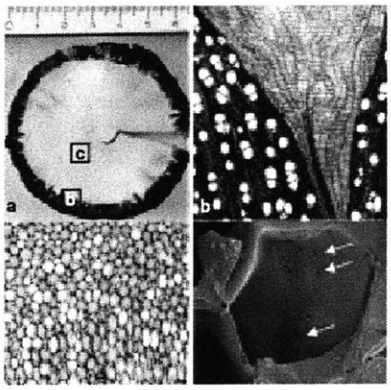

Figure 88- Image of the Arboloco pith under the microscope

	Unit	Arboloco pith (EMPA data)	PU-foam (Literature data)	EPS-foam (extr.) (Literature data)
Density	g/cm³	0.035	> 0.035	> 0.025
Diffusion resistance factor (μ)	-	14.23	30 ... 100	80 -150
Diffusion equiv. air layer thickness (sd)	m	0.256	3 ... 10	8 ... 15
Thermal conductivity (λ)	W/mK	0.0384	0.035 ... 0.040	0.030 .... 0.040

Figure 89

The extraordinary thermal and acoustic qualities of the Arboloco pith can also be compared with fiberglass. What follows below is a comparison made by Professor Luis Miguel Alvarez[39] for Phillips Refrigeration Colombia. The aim of this comparison was to demonstrate that arboloco pith can used to fabricate panels for refrigeration systems.

Parameter	**Arboloco**	**Fiberglass**	**Polyurethane**
Conductivity Kcal/Min	0,024	0,028	0,016
Water Absorption Percentage	2.1	90	0.85
Dimensional Stability at 30 C	Good		Good
Contamination	Low Biodegradable	Medium Glass Filament plus Phenol Resin	High

Figure 90

Chart Explanation (Figure 90)

The isolating capacity of arboloco is equal to that of fiberglass but less than that of polyurethane, a fact which influences the thickness of the isolating walls. Its dimensional stability at low temperatures is as good as that of polyurethane and it has better resistance to condensation. Its absorption of water is greater than that of polyurethane, but less than that of fiberglass.

With respect to the environmental aspect, the heart of the Arboloco has advantages, since the process of applying both fiberglass and polyurethane presents risks for the operators. The fiber of these materials, because of their small particles that can enter the respiratory system and get under the skin, is an irritating factor due to the phenolic resin used as an agglutinant in them and which can cause strong allergic reactions in many people. In the fiber wastes resulting from scraps or obsolete equipment, the glass is non-biodegradable and precise information is not yet available regarding the effects of phenolic resin released in the environment.

[39] Professor Alvarez teaches at the University of Caldas in Colombia.

Polyurethane on the other hand requires careful management of its poliol and isocianate (metil – di -In isocianato components), since the latter produces allergic reactions in both the skin and the respiratory system. Polyurethane wastes are a serious environmental problem: It is not biodegradable, no substance is known to dissolve it, it is chemically inert, and can only be destroyed by burning it. When burned at low temperatures, it produces highly toxic gases. Furthermore, it has not been determined what gases are produced by burning it at high temperatures, but this means of destruction in obsolete apparatuses is not viable because the operation would have to be done jointly with the destruction of plastics and painted metal sheeting with adherents, which makes the process too expensive. It is a huge and difficult to manage amount of waste. So much so, that some countries have actually thought about using compacted obsolete refrigerators as land-fill material upon which to build their roads.

5.5 Experiments

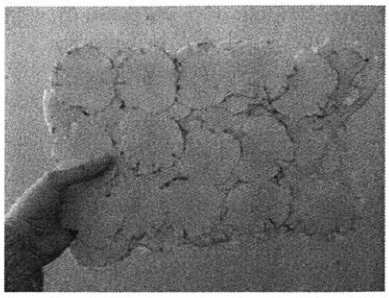

Figure 91– Experiment No. 1, First panel

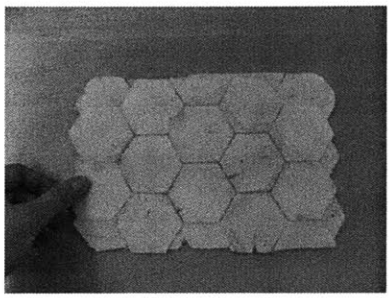

Figure 92– Experiment No. 1, Second panel

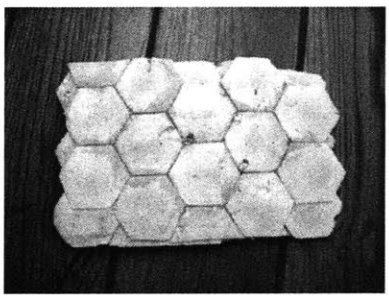

Figure 93– Experiment No. 1, Third panel

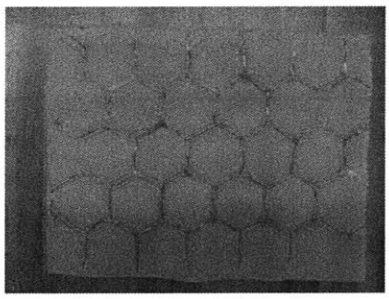

Figure 94– Experiment No. 2

A description of a set of eight experiments that were carried is going to be presented next, the purpose of which is to illustrate the first approaches to the search for a continuous surface.

5.5.1 Experiment No. 1

The aim of the first experiment was to create a continuous surface of arboloco. To achieve that purpose, three two-layer panels were glued and pressed together.

To begin with, thirty-two Arboloco sliced parts were placed randomly on to first form a two-layer panel. A thin layer of rubber glue was then applied between the two. The purpose of this first panel was to create a flexible surface, based on the fact that the adhesive used was a rubber-like one.

The second panel was similar to the first one. The only difference was that this time, instead of placing irregular pieces at random, the pieces were exactly the same this time. Then two layers of fifteen interlocked, hexagonal-shaped arboloco pith pieces were placed in order to give the surface enough resilience. This time the idea was to overlap the joints with complete pieces of arboloco in order to avoid thermal loss and to improve flexibility.

A third panel similar to the previous ones was made using a different type of glue, one that is normally used for paper surfaces. This time the type of glue used was different. It was the one used for paper surfaces. A more rigid panel was created as a result.

Results: The panels that used rubber cement were more flexible than those that used paper glue. A future exercise should include either of them in the joints or over the complete surface.

5.5.2 Experiment No. 2

Based on one of the results of the previous experiment the aim of this second experiment was to create a continuous, self-sustained surface. For that purpose, a three-layer surface was created as a mock-up.

On this occasion, the hexagons were glued to a canvas (first layer) instead of being glued together next to each other. In the process of gluing them to the surface, a space of 5mm was left between squares, in order to place wired structural members (second layer).

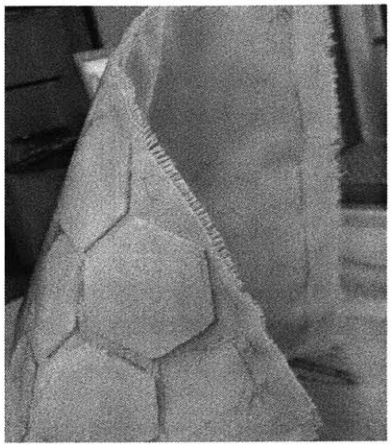

Figure 102– Experiment No. 2

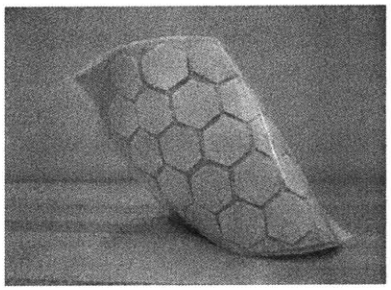

Figure 103– Experiment No. 2

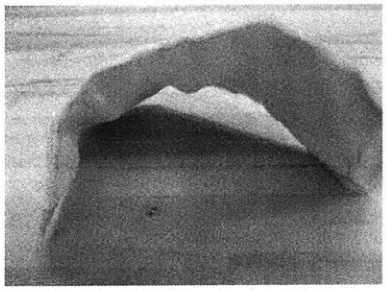

Figure 104– Experiment No. 2

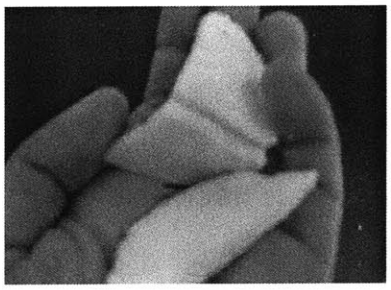

Figure 105– Experiment No. 3

After the arboloco slices and the wire were both completely attached to the canvas, a third layer, of plastic film, was placed. The purpose of this layer, in addition to protecting the arboloco, was also to help to give rigidity to the skin.

Results: A self-sustained surface.

5.5.3 Experiment No. 3

This experiment tried to find a way to make the arboloco flexible enough to be bent without problems. To achieve this, latex was applied to the arboloco slice. The result was really positive because it showed that if arboloco is injected with a rubber-like product, its performance is improved.

Results: It was shown that if this process were carried out on a large scale, this ideal surface could be created.

5.5.4 Experiment No. 4

This experiment replicated the results obtained from the previous one. In it, various slices of arboloco were embedded in the latex instead of being spread out on just one slice.

The same procedure of putting arboloco powder on top was used in order to avoid discontinuity in the material on the surface and to conserve its thermal and acoustic properties.

Results: This experiment permits the production of a continuous flexible surface made solely from arboloco and, therefore, the study of alternative ways to design the surface.

5.5.5 Experiment No. 5

This experiment incorporated the lessons obtained from previous ones.

In this experiment, 2mm-thick slices of arboloco were laid onto a textile material impregnated with one layer of latex and arboloco powder in order to guarantee a continuous arboloco surface.

Results: At this point what was achieved was the possibility of making a thread of this composite and of incorporating it into locally produced fabrics, either in the form of threads or attachable layers.

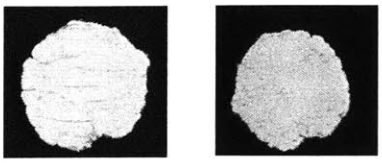

Figure 106– Experiment No. 3. Figure from the left back part of the slice covered with Latex. Figure on the right, front with Latex and Arboloco powder

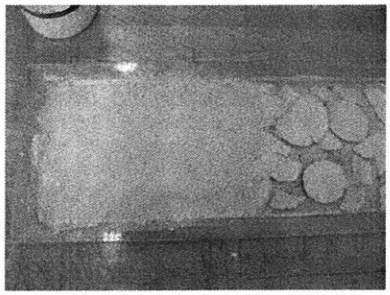

Figure 107– Experiment No. 4

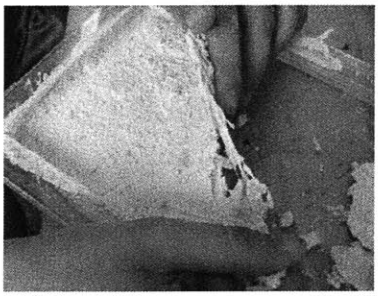

Figure 108– Experiment No. 4

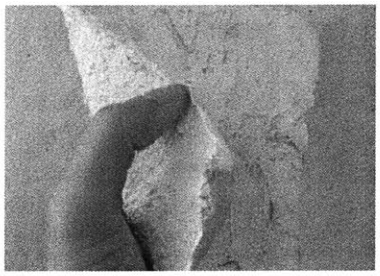

Figure 109– Experiment No. 4

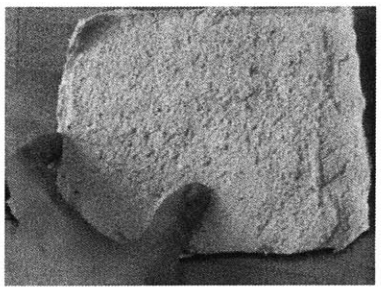

Figure 110– Experiment No. 4

5.5.6 Experiment No. 6

In this experiment, another attempt was made to create a continuous surface. A different approach was taken on this occasion. Instead of pasting the arboloco slices to a continuous surface while maintaining the material's solid-state characteristics, they were blended with a solution of 70 % water and 30 % glue in order to make paper from it.

Results: A continuous surface

5.5.7 Experiment No. 7

This experiment replicated the results from the previous one, but with different parameters. In this case, instead of using Arboloco in solid state, it was used in the form of powder. It was mixed once again with a solution of 30 % water and 70 % glue.

Results: A semi-flexible continuous surface

5.5.8 Experiment No. 8

This experiment was a combination of experiments 2, 3, 4, 5 and 6. It replicated the flexibility achieved in experiments 4, 5 and 6 but without sacrificing the solid state of the piece. (Experiment 2)

Results: A flexible skin, rigid enough to withstand pressures by itself.

5.6 Process of Innovation

The aim of this whole thesis has been to look for indigenous materials and local building skills in Colombia within the context of housing for refugees.

After studying the emergency housing problem in Colombia and reviewing different agencies' approaches to it, I learned a series of lessons about performance. Said lessons led to the realization that the best way to supply emergency housing for refugees is to provide improved component systems which, in this case, create a skin-like surface material instead of imported housing solutions.

There are simple criteria for choosing a material for such a skin-like surface: it must be easy to carry, flexible, light-weight, made of local material, and provide good thermal insulation, so I began looking into local materials that could be transformed into skins. I eventually chose Arboloco because, in addition to its incredible growth rate and special thermal and acoustic qualities, it is readily encountered both near and within the areas of forced displacement.

Figure 111 – Experiment No. 5

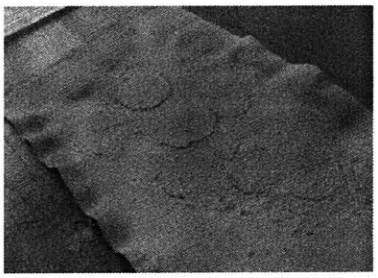

Figure 112 – Experiment No. 5

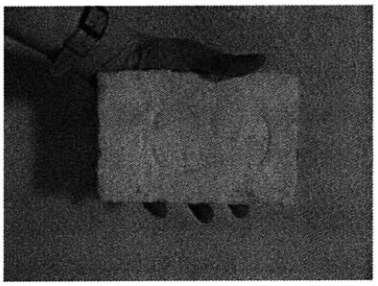

Figure 113- Experiment No. 6

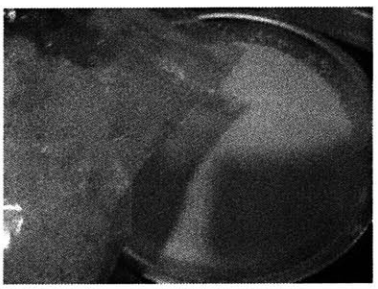

Figure 114 – Experiment No. 7

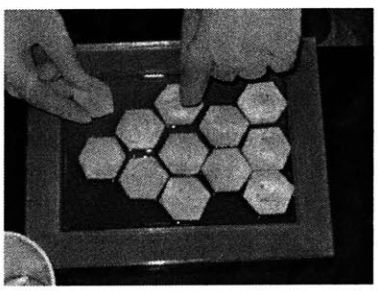

Figure 115– Experiment No.8

There is also the fact that some materials cannot easily be transformed into skins. However, through the exercises described below, I have managed to set up a system that helps to transform it or other local materials into textile-like elements.

What this material approach to emergency housing ultimately does is to enable us to rethink what the ideal solution would be in such circumstances. Therefore, instead of a house-tent approach, the idea is to provide a material that can accompany the refugee during every step of the recovery process: from the emergency period to the transition period and final settlement, which is ultimately its main contribution.

5.5.9 Summary and Conclusions Regarding Experiments

The above-mentioned experiments introduced eight different ways to produce arboloco. Said methods were applied based on previous exercises that tested arboloco pith or medulla material characteristics.

In this set of eight exercises two different approaches were used: i) by experimenting with Arboloco in its original solid state and ii) by experimenting with Arboloco in a transformed state.

i) Experimenting with solid-state Arboloco

In this phase I basically cut, sliced and layered pieces of peeled Arboloco medulla.
In the first set of exercises a group of three panels made of thin, horizontally-sliced pieces was presented.
The initial objective of these exercises was to create continuous panels out of the material and try to avoid the use of other components. The result was a set of 3 semi-flexible panels. (Experiment 1)

ii) Experiments with Transformed Arboloco

Since the idea was to create a textile-like material, other approaches were also explored. For this next phase, a set of 5 exercises was presented. In this stage, instead of working solely with sliced solid parts, work was done with arboloco in both solid and pulverized states, with the addition of other materials as well.

Said experiments allowed me to create flexible continuous surfaces. I first covered one slice of arboloco with latex and when I had achieved the desired degree of flexibility I repeated the experience, but on a larger scale. I then had a continuous surface, but I was still looking for

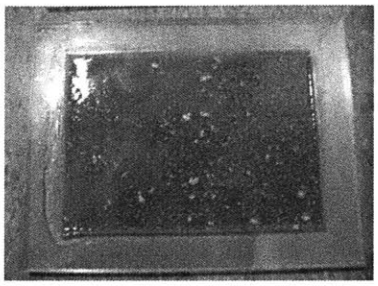

Figure 116– Experiment No. 8

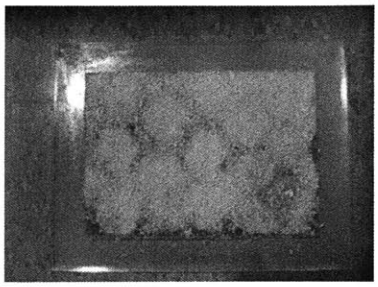

Figure 117- Experiment No. 8

a more homogenous one. I therefore experimented with Arboloco in a powder state and obtained a paper- like surface. After achieving that, I went back to work with solid-state arboloco in order to finding a way to obtain a continuous surface with slices of arboloco embedded into another medium. Experiment 8 was the result.

Additional Note

In order to make something more feasible from the arboloco textile project, it is important to further develop stages one and three (material explorations and manufacturing).

In stage one, i.e., material explorations, eight experiments were presented. These were important to the extent that they permitted a first approach to the material. By means of them it was possible to understand that in order to achieve a continuous arboloco surface, it is necessary to undertake two types of processes: i) composition processes (which were carried out in the experiments and can be replicated on a larger scale) in which the arboloco was mixed or assembled with other materials to obtain flexibility and continuity and ii) manipulation processes at the level of molecular composition, which correspond to the following stage of research where thel objective is to overcome the difficulty of producing a continuous surface with this material and thus manage to make the textile totally out of arboloco.

The following step is then to design, from the microscopic level, the way to control the material, and tus from this scale to improve its flexibility and continuity. For this purpose, it would be necessary to seek the help of a materials scientist.

Moving on to stage two, i.e., manufacturing, apart from what is proposed in point 5.7, to explore the possibility of weaving and sticking LDEs and incorporating a form of flexible solar cells that are currently being developed at Berkley University and which are in the final stages. It is important to keep in mind the need to develop the way in which the textile is going to be produced. If the decision is made to continue with the scheme proposed in the composition processes, it is necessary to organize a way in which these processes can be carried out on the site or close to it and to replace or find an alternative to latex.

Both types of processes are important and necessary. The first can be done locally giving the community the opportunity to benefit from producing the textile in terms of employment and income. The second type can produce more efficient textiles which can be applied in

producing skins that can be incorporated on the site by transporting them in rolls or in some other type of architectural application.

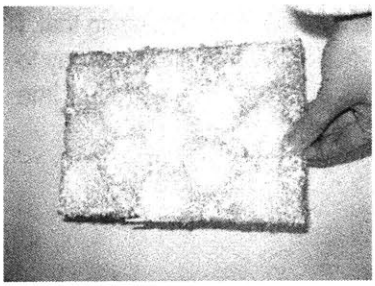

Figure 118– Experiment No.8

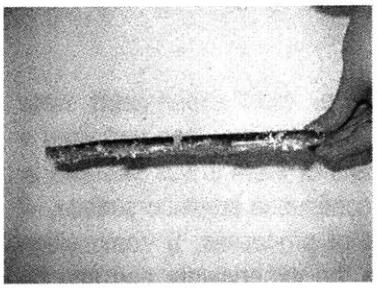

Figure 119- Experiment No. 8

Figure 120

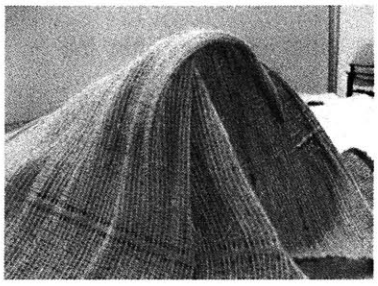

Figure 121

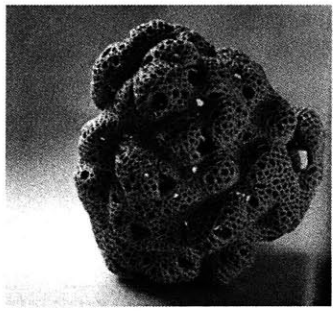

Figure 122

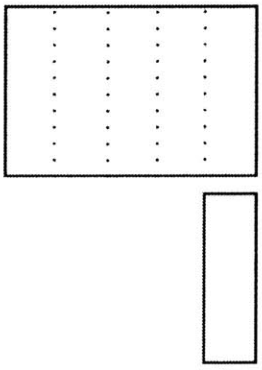

Figure 123

5.7 Future Explorations

This thesis is just the beginning of a long five-step process and it can be argued that each step could be the basis of a thesis by itself. The steps are: i) material experiments and explorations, ii) component design intentions, iii) manufacturing studies, iv) field tests or proof of concept, and v) marketing.

i) Material Explorations:
Goal: To achieve a continuous flexible skin.

1. To explore the material properties
2. To establish performance lessons

ii) Component Design Intentions:
Goal: To develop component parts made of the arboloco textile for emergency housing solutions.

Use during the emergency period:
a) Design a rolled single skin that could be:
1. A continuous textile made from arboloco without a structure that can be used as covering. It can be placed on top of wooden or metal poles and tied with ropes, as seen in Figure 55 in chapter three, or it can be attached to already existing structures.
2. A continuous textile made from arboloco with a woven internal structure that helps the fabric to stand by itself. In this case the textile can work as a single skin envelope as seen in Figures 120 and 121. These images were inspired by the internal space qualities of the folded woven structure that appears in Figure 122.
3. Use the textile made from arboloco to produce threads from it. As Figure 123 indicates, the arboloco textile is divided into various subparts that can be easily torn into strips. The strips can then be woven *in situ* into existent local textiles such as bundles in order to improve the thermal and acoustic characteristics of the textile.

Image 124 nicely illustrates how this skin evolves during the emergency. At first, it supplies the emergency envelope and then it "grows" by adding different layers to the refugee's body.

Use during the transition phase:

b) Design panel systems that could be:
1. A wall system
By stretching the arboloco textile (either the one made entirely of said material or the one that is made with woven parts) onto a wooden or

metal frame. These panels can work as either external envelopes or internal partitions.

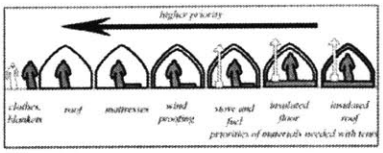

Figure 125

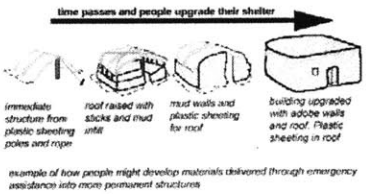

Figure 125

Use during the permanent phase:

c) Roofing Material

1. The Arboloco textile can be used as part of a roofing system for a permanent solution. Figure 125 shows an evolution scenario in which the first skin, i.e., the tent, later evolves into a roofing material. [40]

iii) Manufacturing

Goal: To manufacture the products described in the paragraphs above, but in an industrialized way.

1. Explore the possibility of incorporating other elements into the textile to increase its natural performance.

1.1. Woven or attached LDE's.

1.2 Pasted or sprayed solar cells.

iv) Field Test or "Proof of Concept":

Goal: To test the ideas described in the field to see if they work.

v) Marketing

Goal: To promote the product within the relief sector.

[40] Images 125 and 126 in a sense represent the role that Arboloco's textile could have through out the whole recovery process. Arboloco's textile can replace plastic sheeting on the processes described on those graphs

Chapter 6: Conclusions

This research was meant to be a starting point for a body of work that would focus on the issues of supplying emergency housing for internally displaced populations in Colombia.

Although at its conception this thesis started out with a much more focused goal – the design of an emergency shelter – it became clear to me through the dual process of field research in and bibliographical research, that the issues that surrounded the lives of these people were too complex and multifaceted to be reduced to just a tent or any other emergency housing solution. I therefore understood by observing the IDPs' material culture[41] that the "solution" should be more comprehensive in order to make it work. This means not limiting it to the design of a single, static element, - a skeleton or a house - but understanding the profile of the population, the culture in which the solution is inscribed, the available resources, and also seeing the possibility of introducing innovation in building processes. In other words, it means thinking about an element or material that would accompany the refugee throughout the recovery process –a skin that could evolve through time-.

Therefore the goal of this exploration changed. Instead of addressing the emergency housing problem directly by making a design which could eventually repeat the same failures as those of the agencies,[42]I decided to investigate topics or studies that could help to understand emergency housing problem in a broader scope. In chapters two to four, three main topics were identified briefly and explained with regard to their relevance to this project, supporting the idea that skin is a better solution than a skeleton and also seeking a way to make said skin better.

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[41] Manipulation of local fibers and materials for the fabrication of hand craft daily use such as baskets, textiles, mats, etc.

[42] What is conventionally offered by relief agencies such as Oxfam and UNHCR is a collection of multiple static solutions that cause a rupture of the recovery process or "bouncing back" momentum in the displaced community. What they "accomplish" through their aid is a complete rupture in the evolution of the recovery process. They divide it into the following three "stages": emergency, temporary, and permanent periods, without considering that what is offered as a first aid solution ideally should be part of the final settlement. For example, by offering tents, prefabricated houses, or polyurethane igloos, they do little for the possibility of constructing a more permanent house. With this top-bottom approach they do not permit a real recovery because these temporary solutions, which are not designed to be improved, became permanent. So what I will help to resolve with my design solution is the common dilemma of immediate help vs. permanent solutions by offering an element that will be present during the whole recovery process.

The objective in chapter two was to understand the forced internal displacement in Colombia while in chapter three the objective was to learn about how different agencies approach the problem of emergency housing and obtain lessons from their approaches.
Within the same chapter I also came to understand how tents are made: their constituent parts, the materials used, and different types of tents available.
I thus obtained the performance lessons which could then be applied to my material-oriented solution. Last but not least, I also came to understand different contemporary ways of making spaces close to the body and with this information I was able to confirm that the best solution was a skin instead of a tent or any other built environment.

In chapter four the idea of skin, not in material but rather in spatial terms, was examined. There I understood the connection between textiles/flexible materials and architecture which in the end supported the idea of understanding emergency shelters more as edifices than as layered extensions of the body.

With all this information clear on the last chapter I started the first of the five steps in the development of said skin, using a local sustainable material found near or within the areas of forced displacement.

From the very beginning this thesis has been a process of discovery. It has helped me to grasp a very complex problem in such a way as to learn to plan an alternative housing solution within the "chaos" of disaster and poverty: This means abandoning the clean and controlled spaces that designers are accustomed to produce for this type of situation and developing solutions that acknowledge the richness and diversity of the both environment and the people that live within it. In other words, it helped me develop a methodology of experimenting with local materials to develop skins for emergency housing, which can ultimately be repeated with other materials in similar situations.

In conclusion, this thesis contributes to the emergency housing field in the following ways:

- Innovation in the process of supplying emergency housing for IDP's through considering the use of local materials and technologies in an informed way, instead of imported solutions.

- Innovation with respect to understanding emergency housing in a different way; not in building terms but in material terms.

This means developing an alternative material that can accompany the refugee throughout the recovery process, taking advantage of the recovery momentum.

- Innovation in thinking that new developments in architecture can occur in not so attractive fields of practice fields such as emergency housing. If a smart/great insulation envelope could be applied in such difficult conditions, this type of skin could eventually be applied in bigger buildings.

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